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Cheap Journalism.

TO-DAY the closing meeting of the Fuel Conference will be held, and a very memorable gathering of the nations will pass into history. No official visits have been organised to follow the Conference, but it is safe to assume that many of our visitors from overseas will remain in this country for a time, taking the opportunity to inspect collieries, refineries, power stations, and other industrial installations, some of which have already been thrown open to them. Before they disperse, the delegates will not fail to congratulate the organisers on the one hand and their fellow members on the other on the gratifying success of the Conference, which has been attended by over a thousand delegates, and has attracted to its debates many of the most eminent personalities in the spheres of engineering and economics associated with the very comprehensive subject of the convention.

Amongst the concerns which have invited the members to visit their undertakings is the Newcastle-upon-Tyne Electric Supply Co., Ltd., whose several power stations will be open to inspection, including the low-temperature coal distillation plant at Dunston-on-Tyne, which is described elsewhere in this issue. The subject came before the Conference on Friday last, and Mr. R. P. Sloan, in opening the discussion, took the opportunity of repudiating the grossly exaggerated statements which had appeared in the daily Press with regard to the results obtained from the Dunston plant—against which we entered a protest in our last issue. Mr. Sloan had stated in his paper that under present conditions it was not likely that any large direct economies might result from the pre-treatment of coal, and later repeated that no important commercial economies had so far been obtained, as was indicated by the results achieved at Dunston. Nevertheless, with these words before them, some of the daily papers thought fit to create a sensation with the promise of "electricity at a farthing a unit," and one went so far as to allege that the Electricity Commissioners believed that "farthing-a-unit electricity" was "well within the scope of schemes now being evolved by the Commissioners"!

Such statements might be passed over with a wry smile were it not for the serious consequences that they entail. Even when earlier forecasts were made of the

coming of electricity at a penny a unit, disturbance was caused in industrial circles, and contracts for power supply, on the point of signature, were deferred by the prospective consumers, who naturally preferred to wait for the better terms that were foreshadowed. The proclamation of farthing-a-unit electricity must necessarily be still more unsettling and is highly detrimental to the prospects of electricity supply undertakings. This aspect of the matter has, in fact, been pressed upon our notice, and we have been urged to continue our protests against the utterance of these foolish and mischievous announcements. In view of the harm that is being done, it appears to us very desirable that the Electricity Commissioners themselves should take steps officially to controvert the misstatements that have been made, and for which they have actually been made responsible. Stability is essential to the steady progress that we all hope to see; but these false rumours strike at the root of stability.

As we have said, Mr. Sloan in his paper afforded no ground for the inflated forecasts that have been published, and he explicitly repudiated them in a letter addressed to the lay Press, which appears in our "Notes" to-day; but he expressed the belief that progress was being made towards a commercially successful solution of the low-temperature distillation problem. Our confidence in ultimate success is strengthened not only by the interesting information contained in his paper, but also by the trend of progress in other quarters and by the opinions expressed by distinguished authorities. The problem of finding a market for the by-products is always present in the background, and may become a crucial question when the low-temperature carbonisation of coal enters the practical stage on a large scale, but up to the present that difficulty has not arisen. Commenting on the paper on Friday last, Mr. W. M. Selvey pointed out that with Mr. Sloan's process the difficulty of disposing of sulphate of ammonia, coke, and gas, had been avoided, the products were spread over a wide market, and ordinary coal was used—all of which were favourable features.

The Facts of Industry.

At the present time one of the most marked needs of business men is a greater knowledge of the facts of industry. The nation to-day is faced with industrial problems of the gravest import, notably those concerning unemployment and industrial unrest. It is obvious that the mere disclosing of information will not of itself provide a solution to these problems; but at the same time it must be apparent that, in the absence of a proper diagnosis of the malady, it is impossible to bring ordered intelligence to work to devise a remedy for the unemployment evil, while it would seem that the maintenance of industrial peace cannot be ensured without a disclosure of the full facts of industry. A kindred problem is that concerning the business cycle with its attendant disastrous booms and slumps. These cyclical ups and downs have a gravely disturbing influence on employment and prices, and considerable thought has been given to the problem of finding suitable remedial measures. As a result there are several ways in which these movements could be moderated, if not entirely abolished, but clearly no remedy can be applied unless our exact position on the cycle be known. The economic information at present available is quite inadequate to enable us to deal with such problems as these, and in consequence the recently published summary of the 1924 Census of Production provides a welcome and valuable addition to the body of available facts.

Considerable space is devoted in the summary to a comparison between the industrial statistics of 1907 and those based on the 1924 census. Broadly speaking, it is shown that the number of persons engaged in manufacturing and extractive industries increased by nearly a million over the seventeen years. This increase in the number employed was accompanied by a reduction in the length of the average working day, and by short time and irregular working in certain depressed industries; but those influences were counterbalanced by a considerable increase in the electrical power equipment of industry, and on the whole there was a slight quantitative increase in the production per head.

The absence of certain data, however, prevents the results from forming a complete comparison as between post-war and pre-war conditions, and if this were the main object of the survey, the results would of necessity have to be considered disappointing. But the real value of the published information regarding the distribution of man power, the mechanical power and the gross and net output, lies in the fact that it provides a sure foundation upon which to base current and future calculations. To take a case in point, the new data considerably improve the value of the series of index numbers of current production in certain trades recently inaugurated by the Board of Trade, and it is now possible to gauge with considerable accuracy quarterly fluctuations in industrial production.

Nevertheless, figures of production, however perfect and up to date, are of little value if they are not backed up by similar particulars regarding other phases of economic activity. Information of considerable value has been published by the Balfour Committee, and there has recently been a considerable increase in the available employment statistics, but there are several serious *lacunæ* in the body of available facts, noticeably with regard to stocks.

What is needed is that each industry should be encouraged to collect and publish at regular intervals such relevant statistics regarding production, shipments, orders, stocks, employment, and prices as may enable a clear all-round view of the situation to be obtained. Certain industries have already taken steps in this direction; for instance, the British Electrical and Allied Manufacturers' Association supports a statistical department which has already gathered and published some very useful statistics relating to the industry. What we should like to see would be for this and similar bodies to extend the scope of their work and for the other groups of industries not possessing statistical departments of their own to fall in line in this respect. There is little doubt but that the expense involved would be more than justified by the elimination of waste and better adjustment between supply and demand following from the clearer outlook obtained.

The above subject was dealt with on Saturday last at a conference of works' directors and managers, foremen and forewomen, held at Oxford. Sir Henry Bunbury, the Comptroller and Accountant-General of the G.P.O., suggested that industry could more speedily and completely organise a service of statistics of production, capacity, unfilled orders, &c.—live and up-to-date information guiding them as to the immediate and prospective course of any given industry if they had the backing of a Government Department.

The Economic Use of Coal.

The report of the National Fuel and Power Committee, briefly summarised in our last issue, was published at an opportune moment—on the eve of the Fuel Conference—and records the view, to which that Conference lends confirmation, that a much wider and deeper interest is now being taken in fuel and power questions than was formerly the case. In this country coal was cheap before the war, and economy in its use was a minor consideration; now, however, the case is altered and the increased cost of fuel has directed attention not only to the necessity of economy in its use, but also to the importance of utilising it to the best advantage. In this connection the recently formed Institute of Fuel has a valuable rôle to play, and the proceedings at the Fuel Conference should provide it with abundance of material to digest at leisure. In the United States an International Conference on Bituminous Coal is to be held in November next. It cannot be doubted that all this activity will bear fruit in due season, and in view

of our dependence on coal for the bulk of our power, light, and heat, the world-wide movement must be regarded as of great significance and interest to us all.

Of the total consumption of coal in this country, only 5 per cent. is used for generating electricity within the cognisance of the Electricity Commissioners (probably the figure would be increased to 8 or 9 per cent. if statistics relating to privately owned electrical plant were available); whilst the output of electrical energy has increased in seven years by no less than 92 per cent., the consumption of coal is only 25 per cent. greater than in 1921, thanks to the economies already effected. Similarly, whilst the quantity of gas made annually has increased by about 20 per cent. in the same period, the consumption of coal for gas making is only about 12 per cent. greater, being now about double the amount consumed in electricity works. In both cases the figures are small in comparison with the huge quantities consumed in industry (40 per cent.) and for domestic purposes (22 per cent.). As we have pointed out on previous occasions, it is very desirable that the actual amount of electricity generated for industrial purposes of which the Commissioners have no data should be ascertained, and we note with satisfaction that a suggestion emanating from the Federation of British Industries, that a national survey of the energy requirements of industry, including an analysis of the means adopted for providing light, heat, and power, should be carried out by the Board of Trade, has been favourably received by the Committee.

An immense amount of research in connection with fuel problems is being carried on by various bodies, and the Committee was impressed with the necessity for providing a highly-trained *personnel* for this purpose, the lack of which—due in part to the uncertainty of an assured career—has been felt in many quarters. This, in the opinion of the Committee, is a matter that should be rectified by the industries concerned in co-operation with the Universities and the Board of Education.

We cordially welcome the Committee's approval of the system of buying and selling coal to specification, as we have urged in time past. It is singular that, whilst all other power-station stores are strictly controlled, the most important item is in most cases very loosely defined and is subject to material variations in quality and condition. This, again, was a matter the importance of which was explained to the Committee by representatives of the Federation of British Industries. We are glad to know that the British Engineering Standards Association has set up a sectional committee to deal with the subject.

Electricity in the Irish Free State.

On September 18th the charges that will rule for electricity supply to towns in the Province of Leinster during the coming winter were published by the Electricity Supply Board. A two-part tariff has been adopted, consisting of a fixed charge depending on the Poor Law valuation of private houses and business premises, plus 2d. per kWh consumed for all purposes except industrial power. The fixed charge is based not on a percentage, but on a scale ranging from 6d. per week where the valuation is less than £5 to 2s. 6d. per week where the valuation is £20 and upwards, in the case of dwelling houses, and from 9d. per week (less than £5) to 4s. per week (£35 and over) for business premises. Thus the smallest house will be charged 26s. per annum and the largest £6 10s. per annum, plus 2d. per kWh. The principle involved is that the rates above-named are estimated to be equivalent to charging for the normal electric lighting consumption at 6d. per kWh and for all else at 2d. per kWh. Supply will be available in about 2½ months, when the 10-kV lines connecting the town distribution systems to the "Shannon Leinster Loop" have been completed, the loop being fed from the Dublin Corporation Pigeon House station until the Shannon plant is at work.

The Board has issued a lengthy statement explaining the system of charging and the reasons for its adoption, and claiming that 6d. per kWh for electric light is "an extremely low rate for any country town in Europe." The Board does not wish consumers to adopt large-scale electric cooking, water heating, or extensive electric heating, at present; that is to come later, when it can provide the necessary apparatus on the hire system. Certainly the rates quoted will not tempt the consumer to adopt "Electricity for Everything"; electric lighting at 6d. per kWh, though much dearer than in many English country towns, is not prohibitive, but for "other purposes" 2d. is about double what is commonly charged, and the Board's claim that it is a "sound rate" will not convince the consumer that electricity is cheap in Leinster. The charge for wiring on the hire-purchase system is to be 6d. per week per outlet until 52 payments have been made—or 26s. per outlet in all; to premises valued at less than £7 10s. a concession is made by spreading the payments over twice the period, to encourage "even the most modest householder" to use electricity. As the latter class is in the great majority, this is sound strategy, though it will tend to develop the lighting peak rather than "other uses" of electricity. It must be borne in mind that probably another year will elapse before the Shannon scheme commences operation in Leinster, and therefore we must not criticise these prices, based on steam-generated electricity, as failing to fulfil the promises of the Free State Government; they appear to have been favourably received by leading Irish engineers.

Television.

The annual report of the American Institute of Electrical Engineers Committee on Communication states that recent demonstrations of the transmission and reception of both still pictures (facsimile photo-telegraphy) and moving objects (television), utilising broadcast transmitters, have "indicated the probable future extensive application of these features" to the present broadcast radio-telephone service.

Photo-telegraphy has, of course, been in use for some time also in England and on the European Continent; but, whilst television has been demonstrated in America in what may be termed the laboratory fashion, with the aid of a "small army" of operators and somewhat complicated apparatus, which points to its not yet being a commercial proposition, in Germany it does not appear to have passed beyond the stage of sciagraphy. In England, however, development has been such that "Televisors" (which are referred to elsewhere in this issue) were on view at the National Radio Exhibition last week.

The Baird Television Development Co., Ltd., is not a manufacturing concern: its intention is to license other companies to make and sell the apparatus, whilst representatives of the Post Office have recently witnessed demonstrations of both wire and wireless transmission with a view to the extension of the present facilities. The operation of the Company's experimental station in London (which is of 4-kW power with a radius of 50 miles) is limited to between 12 midnight and 12 noon, and orders for receiving instruments will be accepted subject to extended transmission facilities being granted by the Postmaster-General.

Television, with the human voice synchronised with the picture, has often been foreshadowed: Mr. John L. Baird has achieved a considerable measure of success, and a recent demonstration convinced us that the results he now obtains are a material improvement on his earlier ones. The art has reached a stage which is at least comparable with, if not slightly better than, that of voice and music reproduction when broadcast radio-telephone apparatus was first marketed commercially. It is by no means perfect, of course, but without doubt the transmission almost instantaneously to a distance of images of objects by telegraphy, either wire or wireless, has been accomplished.

Electricity Supply at Huddersfield.

The recently inaugurated extensions at the Huddersfield Electricity Works include two 6,000-kW English Electric turbo-alternators, Stirling boilers and Metropolitan-Vickers switchgear.

WEDNESDAY last week was an important day for the Huddersfield Corporation Electricity Department; jubilee celebrations were held, and a special feature of the programme was the official inauguration of the recent extensions to the plant by the Mayoress, Mrs Rowland Mitchell, and the wife of the chairman of the Electricity Committee, Mrs. Thomas Shires, J.P.

The extensions include two new steam turbo-alternator sets, "Florence" and "Alice," which, it is claimed, represent the very latest practice in electric power station machinery. The chief characteristics of the new sets are the subdivision of the turbines into two separate cylinders, the h.p. and l.p. ends, and the speed at which they run, 3,000 r.p.m. Referring to the illustration, fig. 1, which shows the two sets in the foreground, the various parts of the units may be described briefly as follows: On the left of each set is the steam inlet valve with the governing apparatus which maintains the speed constant with great accuracy. The left-hand cylindrical casing is the h.p. cylinder into which the steam from the boilers enters at a pressure of about 200 lb. per sq. in. From the right-hand end of this cylinder the steam passes at a much reduced pressure through short connecting pipes to the l.p. cylinder, and the exhaust from this passes to the surface condenser situated immediately below in the basement. The condensing water is drawn from the river and canal, and after passing through the condensers it is pumped to cooling towers. The condensers for the new turbines were supplied by Messrs. Hick, Hargreaves & Co., Ltd., and the auxiliary pumps for them are driven by "Brook" motors. Next in order is seen the alternator, which generates three-phase energy at a pressure of 6,600 volts and a frequency of 50 cycles. The small machine on the extreme right is a d.c. generator which furnishes the current necessary for the field excitation of the main alternator. Each of the new sets has a normal rating of 6,000 kW, but is capable of giving over 7,000 kW under emergency conditions. It may be mentioned that the firm which manufactured these sets, the English Electric Co., Ltd., designed and installed the first machine of the two-cylinder type at Bradford in 1925. It is of interest to record that the present turbine room, which now contains 23,500 kW of steam-turbine plant, with room for expansion up to 30,000 kW, is the identical building which, when erected in 1893, housed three sets aggregating 250 kW. The original plant consisted of Brush high-speed vertical engines driving by ropes three Mordey-Victoria single-phase alternators generating at 2,000 V. The whole of the modern turbine plant in the present station consists of English Electric turbo-alternators.

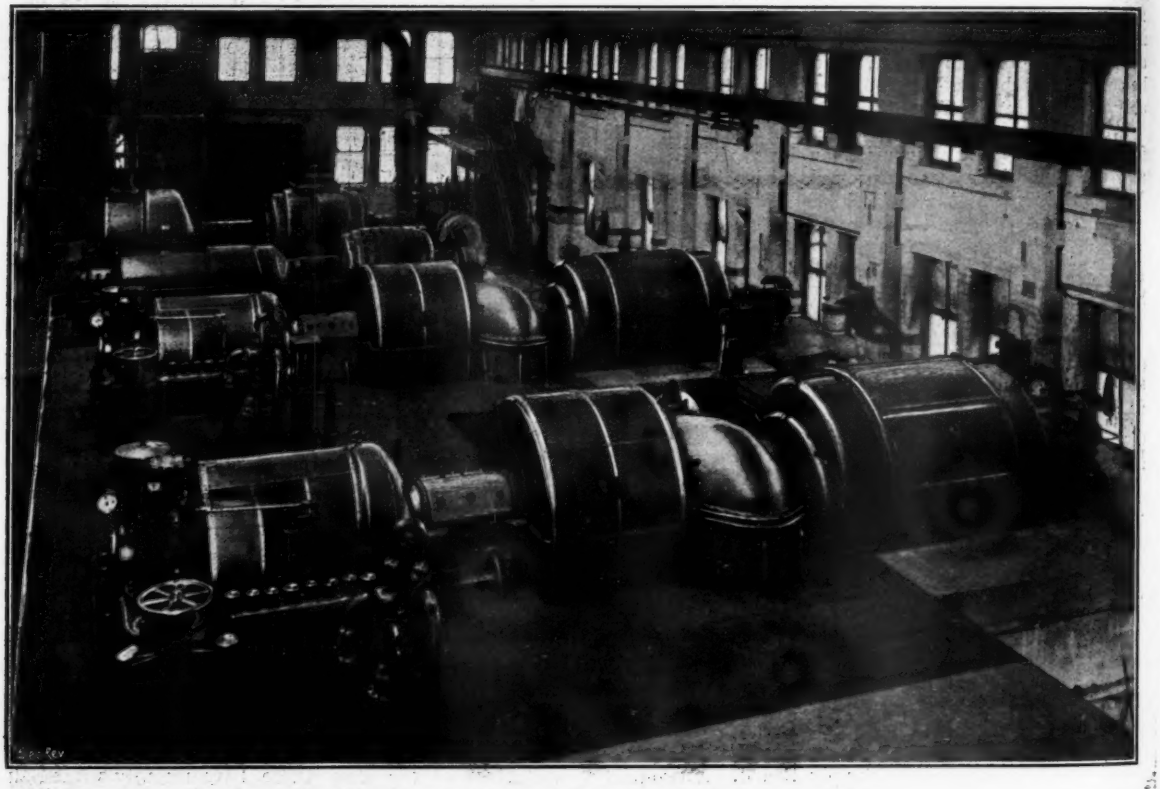


Fig. 1.—Turbine Room at Huddersfield; 6,000-kW Sets in Foreground.

Concurrently with the modernising of the generating plant, the boiler house has likewise been remodelled and brought into line with the latest practice. It contains 13 Stirling water-tube boilers on two sides of a central aisle, fig. 2, and the steam from these will be supplemented by that derived from a highly-efficient refuse-destructor plant of the latest Woodall-Duckham design. The main boilers are capable of producing steam at a total rate of 380,000 lb. per hour, and the four destructor boilers will produce 48,000 lb. per hour, equivalent to a coal consumption of approximately 25 tons per hour. Coal for the boilers is delivered into overhead

bunkers, from which it falls through chutes into the furnaces. For raising the coal to the bunkers there is a complete telpher equipment, which is available for handling rail-borne coal delivered at the gas works siding, as well as for coal brought to the electricity works by the Corporation motor transport department. The ash from the boiler grates falls into chutes, and is discharged into an underground sluice, which carries it outside the building. It is then lifted into a large hopper arranged for filling trucks or lorries as required.

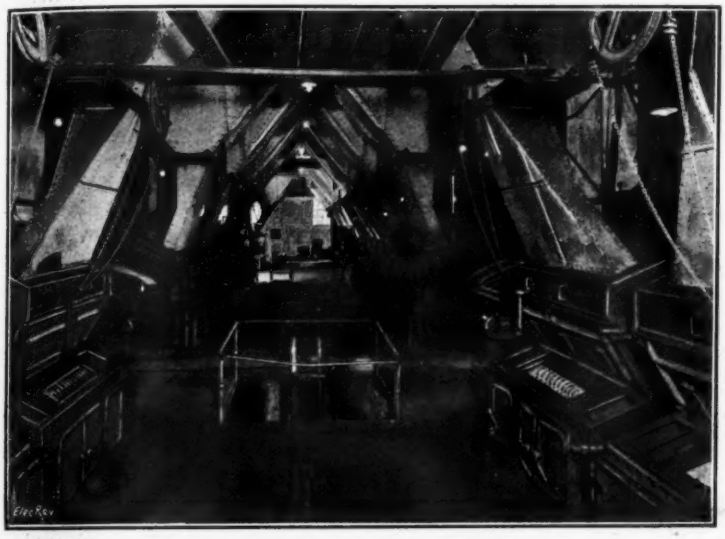


Fig. 2.—Looking down the Boiler Room Avenue.

	1893.	1913.	1928.
Capacity of station—kW	250	8,600	23,500
Maximum demand—kW	160	3,850	18,000
Number of consumers ...	112	5,418	17,350
Units generated	120,000	9¼ millions	45 millions
Coal consumed—tons ...	154	23,600	45,500
Lb. of coal per unit ...	(1903) 9	5.4	2.2
Total capacity of motors connected—h.p. ...	—	7,490	28,000
Price per unit—pence ...	6	4	4 to ¾

The whole of the electrical output of the station is controlled from a switchgear annexe adjoining the turbine room. This contains the 6,600-V oil-immersed switches, and in front of them the main control board, fig. 3, on which are mounted all the necessary instruments, meters and switch-operating levers. The switchboard operators can control the speeds of the generating units by electrical means, and can convey to the turbine drivers the necessary instructions by means of efficient electrical telegraph apparatus. The whole of the switchgear was manufactured and erected by Messrs. Metropolitan-Vickers, Ltd.

Fig. 3.—Main Control Board.

When it was first decided that Huddersfield should have electricity, there were only some half-dozen towns in the country with a public electricity supply. Since that time the undertaking has shown a fine record of economic and engineering progress, attributable in large measure to wise administration, a sound financial policy and consistent extension of the plant, so that its capacity has always been sufficiently in advance of the demand for current. The particulars given in the foregoing table show in a striking manner the progress of the undertaking. The figures for 1928 are, of course, estimated.

A point of considerable interest is that the total expenditure on the Huddersfield station, as compared with the output obtainable from the existing plant, shows that the cost per kW is less than £12. As the capital expenditure has a very great influence on the cost of generating, and therefore on the selling price per unit, there is no doubt that the undertaking is in a very favourable position for giving a low-priced supply.

We are indebted to Mr. J. W. Turner, borough electrical engineer, for the above information and the photographs.

At the "christening" ceremony, Alderman T. Shires, chairman of the Electricity Committee, said that with the installation of the two new turbo-alternators the undertaking had risen to the highest mark of efficiency that had ever been attained in its history. The new plant had made it possible for the department to reduce its charges, and if the undertaking progressed in future years as it had since 1893, then the electricity charges in the borough would be very low indeed.

As the ladies performed their parts in the ceremony, by breaking bottles of champagne on the turbines; a design on each machine showed its name electrically illuminated.

Mr. P. H. Symonds, of the English Electric Co., Ltd., presented souvenirs in the form of silver cake stands to the Mayoress and Mrs. Shires.

It is reported that the new plant at the electricity works was installed at a cost of £120,000.

The celebrations referred to early in this article included the official opening of a new 'bus garage for the Tramways Department, capable of accommodating seventy vehicles.

Alderman Canby, chairman of the Tramways Committee, presided over the proceedings at the opening of the garage. He said that the 'bus was their youngest child, but a healthy and growing one. Last year the Corporation carried 6,000,000 passengers. They had sixty 'buses, which were written down to the sum of £18,000, and they had reserves of about £23,000. Alderman Woffenden, in calling upon Alderman Canby's daughter to perform the ceremony, reminded those present that the Tramways Committee had in the past called upon the ratepayers for a subsidy. They had now, however, paid back every penny with five per cent. interest in relief rates.

The Mayor said the garage had a floor area of 5,000 sq. ft., and there was also cellar space.

Stocking and Trade Counter Selling.

Organisation for Electrical Supplies Manufacturers.

By E. KILSBY MUIR, A.M.I.E.E.

"HOW much longer am I going to be kept waiting?" Buyers who are accustomed to visit the trade counters of large electrical supplies manufacturers and wholesale houses will frequently have overheard this expression of annoyance from other buyers, and have no doubt also on many occasions lodged similar complaints themselves.

The purpose of this article is to prove that there is something radically wrong with our present method of stocking and serving trade counter customers, and to suggest alterations which, in the author's opinion, would enable wholesale suppliers to give adequate service to customers without any additional expenditure being involved.

I will only briefly refer to the present-day method of warehouse stocking and trade counter facilities, as these are already well known to those who will be interested in this article.

The present practice is to store the goods in a portion of the premises, set aside for this purpose, and have a trade counter usually situated on the ground floor near the entrance. Skeleton stocks of some of the leading lines are kept behind the trade counter, and there may also be seen an inadequate display of seasonal goods near the trade counter according to space available.

A customer calls with a mixed order calling for: (1) fittings and glassware; (2) domestic appliances; (3) general wiring accessories; (4) cables and flexibles; (5) lamps; or (6) wireless goods and valves, &c.

We find from experience that, whereas he may be successful in being served quickly with one or two of the items of the above lines, there will be endless delay in obtaining the other lines, *i.e.*, the goods which, owing to shortage of space behind the trade counter, are stored in other parts of the warehouse.

Another reason for delay is usually the shortage of staff behind the trade counter, and a customer may, therefore, be kept waiting for some considerable time before actually being attended to, and then later also find delay owing to the goods called for having to be collected from the main stores.

Further reasons for delay are due to the person serving a customer also having to attend to the accounting side by way of making out invoices, receipts, &c., whereas if this part of the transaction was dealt with by an invoice clerk, the trade counter hand would be free to serve another customer.

From the above brief remarks it will be seen that there are many so-called "snags" in the present system of trade counter service.

Drastic changes are recommended, and the author would suggest the following for the consideration of wholesale suppliers and manufacturers:—

Abolish trade counters as they exist to-day. Open the warehouse and stores to the trade. Sectionalise the products on the lines already indicated in this article, *i.e.*, fittings and glassware, domestic appliances, general wiring accessories, cables and flexibles, lamps, wireless goods and valves, &c., and allocate suitable floor space for each section or department. Make each section self-contained, *i.e.*, here should be situated the buyer responsible for the department, and also the salesmen, order clerk, junior assistants and apprentices. Suitable counters should be provided in the centre of the department for serving customers from and for displaying the goods, as well as show cases and shelves and bins for storing the goods.

Under this system, our salesmen, storekeepers and apprentices would work under more congenial conditions than at present; they would take more interest in their work, as they would be under constant observation of their seniors, and they would have a better opportunity of learning the trade, mingling with customers and accordingly to qualify for advancement.

They would execute daily post orders, as well as attend to customers, and they would be responsible for suitable displays of the department's goods, adequate space being available for this valuable purpose.

Just consider the many advantages and superior service which could be given to customers under these conditions. A customer would not only be served more quickly and by a specialist salesman, but he would also be able to obtain any special technical information of which he might be in need, as the buyer and senior staff would be ready at hand.

A customer would at the same time be able to inspect any new lines displayed, and a good salesman would also have ample opportunities of showing any clearance lines which would from time to time be for sale in the department at special attractive prices, such as non-standard lines, travellers' samples, shop-soiled goods, &c.

It is suggested that each separate department of a large manufacturer's products should be organised on these lines. A trade buyer would visit any department in which he wanted to make purchases, and in the first department at which he made a call he would, if he intended visiting other departments, be handed a card giving a list of the manufacturer's departments, and a mark should be made by the salesman against each department visited.

The goods purchased would be passed to the dispatch department, where the goods from the various departments as indicated on the buyer's card would be invoiced and packed together and collected by the customer, who would either pay cash or sign for the goods and have them charged to his account.

Under normal conditions, it should be possible to have the goods invoiced and ready packed by the time the customer calls for the goods at the dispatch department. The goods could, of course, either be taken away by the customer or arrangements made for them to be forwarded through the usual channels.

Similarly, telephone orders and inquiries should be passed direct to the department concerned, and each separate department would also be responsible for any unexecuted outstanding orders and all correspondence appertaining thereto.

The minor details in connection with this system are merely a matter of routine arrangements, and would, in the author's opinion, not represent any difficulties.

Manufacturers often experience difficulties in finding travellers with the necessary experience and personal knowledge of customers. These men are usually recruited from the order or estimating departments, and they are, therefore, not known to any of the customers, having worked in watertight compartments, whereas under the suggested system the order clerks at any rate who take up travellers' appointments would have the advantage of personally knowing many customers before starting on the road. This point alone should, in the author's opinion, turn the balance in favour of the suggested system of open warehouse practice, for what is

more important than to be able readily to lay hands on new travellers who already are known to the company's customers?

The author also believes that if customers knew that they were likely to meet men of experience and to see something of interest when calling at wholesale houses, the principals and buyers of firms would make visits far more frequently than they do at present, as it must be admitted that there is nothing more unpleasant than to be kept waiting at an uninteresting trade counter.

Frequent visits of influential buyers means increased turnover.

The system suggested has many other advantages, apart from the ability to serve buyers in an adequate manner. Stocks would be kept in a tidier and better condition, being exposed to the notice of management. Order clerks would be on the spot to ascertain quantities in stock of any lines and to watch the movements of goods and the placing of repeat orders with the factories.

Apprentices would be given better opportunities to learn the trade by being in closer touch with their seniors and by being able to watch the complete organisation of a department, and the routine working therein.

In conclusion, it will no doubt interest some readers to know that, whereas this suggestion is new to the electrical industry, there are many large well-known manufacturers in other industries in the country who have their warehouses arranged on the lines suggested, old prosperous firms which were established long before the electrical industry commenced, and have therefore had considerably more experience in studying warehouse stocking and trade counter selling organisation.

Rural Electrification.

A brief description of the rural electrification work carried out by the Swedish Royal Electricity Board, especially illustrating the influence of the price of energy on its consumption.

By ALFRED EKSTRÖM, D.Sc., M.I.E.E., and VIDAR EKSTRÖM, Civil Engineer.

IT has been said that the total consumption of electricity per year per head is an indication of a nation's cultural evolution. No doubt this assumption may be objected to, the large energy consumption of industry being a very dominating factor in the total energy consumption; even if a high culture is undoubtedly contributive to the industrial evolution of a nation, there are many other factors which are of more importance in this respect, for instance, natural resources and wealth. The non-industrial electrical energy consumption per head may, however, be considered a good measure of the standard of life of a nation.

The importance to the electricity supply undertakings of a low price for the energy consumed has, perhaps, not yet been sufficiently appreciated. The supply undertaker, on the one hand, fears that a reduction of price will cause a decrease in the profit of the undertaking; on the other hand, the consumer accentuates his contention that a large consumption can only be obtained by means of low energy prices, and that a large consumption at a low energy price, combined with an efficient and sound selling policy, results in a larger economic profit for the undertaker than a smaller consumption at a higher price.

Swedish official statistics recently published include an account of the business of the Royal Electricity Board during the year 1927. Several interesting results regarding the rural electrification work of the Royal Board can be deducted from this publication, especially illustrating the effect of the energy price on the energy consumption, and *vice versa*.

The rural electrification work of the Royal Board during the past ten years has covered the larger part of Central Sweden. At present the Royal Board has electrified about 568,000 har of arable land, or about 54 per cent. of the total arable land in this district. The population of the electrified district amounts to 513,000 persons; on the electrified area there are living about 0.9 persons per har of arable land, and the density of the population amounts to about 60 persons per sq. mile. The degree of cultivation = arable land/total land = c:a 27 per cent.

The Royal Board has divided part of Central Sweden into about 350 different smaller districts. In the centre of each district the Royal Board has erected a transformer station from which it sells three-phase a.c. at 1,500 or 3,000 volts, generally to an Electrical Distribution Co-operative Society, the task of which is to supply all the small consumers living within the districts. The Royal Board has erected the power stations and transmission plant, including high-voltage lines at from 110 to 20 kV, as well as the necessary transformer stations, in a technically and economically quite satisfactory way.

The small distribution plants, however, belonging to the Co-operative Societies, including overhead lines at 1,500 or 3,000 volts, and 220/127 volts, as well as transformer stations at 1,500 or 3,000 volts to 220/127 volts, having been built during the war by the leaders of the societies, who lacked technically qualified training, have generally not been built in a satisfactory way. This is especially evident in the large energy losses of the small distribution plants, which may be caused by war-time substitute materials, for instance, iron instead of copper, as well as by using too large transformers.

On the one hand, for the sale of electricity to the small societies, the Royal Board has for many years used a plain kWh tariff, generally a double tariff at a price of 3.5d. per kWh during lighting time and 1.5d. during non-lighting time. The Co-operative Societies, on the other hand, used a single tariff with a special price for lighting purposes, and another for motive purposes. The result was that small consumers generally paid a very high price for lighting, sometimes up to 12d. and more per kWh, and several pence for motive power. This tariff policy proved to be very disastrous for rural electrification, the consumers reducing the utilisation of electrical energy as much as possible, which resulted in a still higher energy price per kWh, and an alteration thereof soon proved to be absolutely necessary.

In 1923 the Royal Board introduced new tariffs, and at same time the Co-operative Societies generally carried out a similar alteration of their tariffs for their small consumers. The new tariffs* consist in a two-

* Further particulars of this tariff were given in a lecture by Dr. Alfred Ekström, published in the *Journal* of the Farmers' Club, Part 4, May, 1927.

part system, with one fixed price, depending upon the capacity of the connected devices, but independent of the consumption in kWh, plus a price for consumed kWh. The fixed price of the Co-operative Societies to their consumers thus includes the costs of interest and sinking funds for their distribution plant, costs of management, upkeep, and maintenance, as well as no-load losses. The kWh price corresponds approximately to the price which the Co-operative Societies themselves pay to the Royal Board. The table below contains a collection of data obtained from the above-mentioned account of the activity of the Royal Board, as well as from statistics published in 1925 by the Royal Tariff Commission.

	1924.	1925.	1926.	1927.
(1) Annual consumption of Co-operative Societies, millions kWh	28.96	31.71	34.15	38.14
(2) Annual losses in transmission plant of the Royal Board, millions kWh	3.62	3.76	3.88	4.09
(3) Annual consumption at beginning of transmission plant of Royal Board, millions kWh	32.53	35.47	38.03	42.53
(4) Annual income of the Royal Board from the Co-operative Societies, in £	176,000	188,000	186,000	190,000
(5) Annual expenditure on transmission plant belonging to Royal Board, in £	90,000	90,000	90,000	90,000
(6) Annual income of Royal Board at beginning of transmission plant of Royal Board, in £ ...	86,000	98,000	96,000	100,000
(7) Annual income of Royal Board from Co-operative Societies, in d. per kWh supplied ...	1.40	1.38	1.26	1.16
(8) Annual income of Royal Board at beginning of transmission plant of Royal Board, in d. per kWh supplied	0.62	0.64	0.58	0.54
(9) Total number of har electrified, arable land	552,000	556,000	570,000	569,000
(10) Total number of persons living within the electrified area ...	497,000	500,000	513,000	512,000
(11) Annual consumption of the Co-op. Soc., kWh per person	58	63	67	75
(12) Losses in the transmission plant of Co.-op. Soc., %	32	31	30	29
(13) Useful energy consumption, kWh per person	39.5	43.5	47	53
(14) 8% interest on invested capital and sinking funds on debt of Co.-op. Soc. divided per person, in shillings ...	5/7	5/7	5/7	5/7
(15) Cost of energy, in shillings per person ...	7/-	7/6	7/4	7/6
(16) Management, upkeep and maintenance of transmission plant of Co-op. Soc., in shillings per person	1/8	1/8	1/8	1/8
(17) Total annual costs, in shillings per person ...	14/3	15/9	14/7	14/9
(18) Costs in d. per useful consumption in kWh ...	4.7	4.4	4.0	3.6

Remarks regarding the Table.

The following notes explain the derivation of the data given in the table:—

1. Is obtained direct from the accounts of the Royal Board.

2. Is obtained on the assumption of 12½ per cent. energy losses in the transmission plant of the Royal Board, mainly iron losses, which will not be increased with increasing load; the increase in the losses during the following years is thus the result of increasing copper losses.

3. Is obtained from 1 plus 2.

4. Is obtained from the accounts of the Royal Board.

5. Is obtained from the accounts of the Royal Tariff Commission under the supposition that the transmission plant of the Royal Board was not increased during the three years to any extent worth mentioning.

6. Is obtained from 4 minus 5.

7. ,, ,, ,, 4 divided by 1.

8. ,, ,, ,, 6 ,, 3.

9. ,, ,, ,, the accounts of the Royal Board.

10. ,, ,, ,, the official statistics of Sweden.

11. ,, ,, ,, 1 divided by 10.

12. ,, ,, ,, the accounts of the Royal Tariff Commission. Moreover, it is supposed that the energy losses in the distribution plant belonging to the Co-operative Societies improved relatively; namely, the iron losses will not increase materially with increasing energy consumption, the increase from $58 \times 0.32 = 18.5$ to $75 \times 0.29 = 22$ kWh per person mainly resulting from increased copper losses.

13. Is obtained from 11 and 12.

14. ,, ,, ,, the accounts of the Royal Tariff Commission; the increased energy consumption is not supposed to have increased the cost of the transmission plant belonging to the Royal Board.

15. Is obtained from 11 plus 7.

16. ,, ,, ,, the accounts of the Royal Tariff Commission; the increased energy consumption is not supposed to increase the costs of management and upkeep of the plant belonging to the Royal Board.

17. Is obtained from 14 plus 15 plus 16.

18. ,, ,, ,, 17 divided by 13.

The table shows the following remarkable facts:—The development of electricity consumption in rural areas in Central Sweden having been checked for years in consequence of an unsuitable tariff policy, the introduction of a tariff stimulating the consumption has proved a remarkable success. In three years the consumption has been raised from about 40 to 53 kWh per head, while the energy price has been reduced from about 4d. to about 3d. per kWh, and the increase is still proceeding vigorously. It should also be observed that, although the price of energy which the Royal Board obtained from the Co-operative Societies during the three years was reduced, the energy price obtained at the power station of the Royal Board has not decreased to any extent worth mentioning. On the contrary, the power factor having no doubt been considerably improved owing to better utilisation of the energy, the price obtained by the Royal Board per kW and year must have improved: thus the profit of the Board at least cannot have been reduced.

In fact, this result seems to harmonize well with the assumption of prices and consumption in the Report of the Proceedings of the Conference on Electricity Supply in Rural Areas recently published by the English Electricity Commission,† which assumes that under progressive development a consumption of 60 kWh per head could possibly be obtained in the course of a few years at a price of (*a*) 8d. per kWh for lighting, and (*b*) 2d. per kWh for cooking, heating, and general domestic purposes, decreasing according to consumption to 1d. per kWh. If we suppose the following consumptions (*i*) 20 kWh for lighting at 8d. each, (*ii*) 20 kWh for domestic purposes at 2d. each, and (*iii*) 20 kWh for domestic purposes at 1d. each, a consumption of 40 kWh gives an average price of 5d. per kWh and of 60 kWh gives an average price of 3⅓d. per kWh. These assumptions show a rather good coincidence with the results obtained in Sweden.

† Elec. Rev., August 3rd, 1928.

Insulating Oils.

Details of the Tests necessary to ensure the Essential Requirements of high-grade Insulating Oils.

By ARTHUR GILES.

WITH the growth of high-voltage systems and the increased size of electrical plant, oils for insulation and cooling have become commonplace. In the early days of oil-immersed gear, considerable trouble appears to have been experienced; the attention of oil refiners had been chiefly concerned with the production of lubricating oils, and the problem of producing an oil whose chief merit was electrical insulation was not readily understood. To-day, when oil is used in enormous quantities, the problem is only partially solved. In consequence of the above it behoves all users of oil-immersed gear to have some data regarding the oils they are using, but it seems doubtful if many engineers actually test their oils, either when purchased or at intervals during service. With regard to the purchase of oils, the British Engineering Standards Association has drawn up specifications for the various grades of transformer and switch oils (Specification 148—1927), and buyers of oil would do well to quote the B.E.S.A. Specifications when ordering.

While there are several oil refiners whose products are beyond doubt, the writer is inclined to advocate the testing of all oils on purchase, and at intervals depending on the nature of the service. In the early days of oil-immersed gear, it was common practice to use linseed oil in which a quantity of resin had been dissolved, the mixture being termed resin oil. Resin is now, however, banned on account of its tendency to accelerate sludging. The oils now used are obtained from crude petroleum by fractional distillation, and vary considerably in quality. Naturally the more refined oils are the most expensive, but since reliability is the first consideration in high-voltage transformer work, only the first grade oils should be used, leaving the lower grades for the less exacting equipment such as circuit breakers, in which a certain amount of sludging is permissible. The chief requirements for good insulating oils are: high electrical insulating qualities; freedom from corrosive acids, either animal, vegetable, or mineral; freedom from all materials likely to produce oxidisation and consequent sludging; and high flash point.

The following tests are necessary to ensure these qualities:—

Dielectric Strength Test.—The results of this test are, of course, the primary indication of good or bad oil; the object is to find the voltage required to completely break down a layer of oil between standard test electrodes. Samples of oil should first be subjected to the dielectric strength test, when, if they are satisfactory, they can then be submitted to the more detailed chemical and physical tests. In order to attain uniformity, the B.E.S.A. has suggested a standard test arrangement (B.E.S.A. Specification 148—1927). The test pressure should be applied between two 13-mm. diameter polished brass spheres arranged horizontally with a 4-mm. gap. A suitable cell to contain this arrangement can be left to individual ingenuity and resources, although the B.E.S.A. has approved a design for a standard test cell. The chief requirements are that the cell be insulated, and give at least a 2-in. head of oil above the electrodes. The test should be made at 60-68 deg. F. With the above arrangement the maximum stress in the oil would be

$$R_{max} = (v/0.15) \times 1.208 \text{ volts per inch,}$$

where v = maximum volts between the electrodes, provided that the middle point of the h.p. winding of the test transformer is earthed.

In most cases one terminal of the test transformer would be earthed; then

$$R_{max} = (v/0.15) \times 1.253 \text{ volts per inch.}$$

Using standard ½-in. (13-mm.) electrodes, good oil would require a minimum of 22 kV (r.m.s.) for complete breakdown. The test is made with a gradually increased voltage until an arc-over occurs. If the test is observed closely, it will be seen that, preliminary to the formation of an arc, there is a slight intermittent sparking, accompanied by the formation of fine hair-like threads of carbon between the electrodes. This does not, however, appear to influence the dielectric strength to any marked extent. The test voltage is raised until a complete arc-over occurs, which is identified by its characteristic sound, apart from the visual effects. It is important that the preliminary sparking be ignored, since the establishment of an arc is the only reliable indication of dielectric strength. Insulation resistance tests are not a safe guide to dielectric strength, oil having the descending temperature coefficient characteristic of an electrolyte.

Tests for Moisture.—Water in insulating oils naturally spells disaster. It has been estimated that .03 per cent. of moisture will lower the dielectric strength by as much as 25 per cent. To actually detect moisture is fairly easy, and the well-known "poker" or "needle" test is entirely reliable. A knitting needle or piece of wire is heated to redness, and just as the glow dies out it is plunged into a small sample of oil. If any moisture is present it will be indicated by a series of pronounced cracking sounds, while if the oil is dry there is simply a hiss and a puff of smoke. This test appears rough and ready, but is surprisingly effective; the writer has succeeded in readily detecting one part in 50,000, or 0.002 per cent. content. Moisture may also be detected by boiling a sample of oil, when the oil will froth and steam come off, which may be seen by holding a cold piece of glass over the boiling oil. Trouble with moisture is unlikely in newly purchased oil, but may sometimes be suspected in used oil, or in oil which has been in stock for some time. It is important when taking test samples to draw always from the bottom of the transformer and storage tanks. Oil should always be stored in steel drums and never in wooden casks, in order that the moisture risks may be minimised.

Detection of Sulphur.—Sulphur is objectionable since it attacks copper windings. It may be detected as follows: About 25 c.c .of oil, in which is placed a piece of polished copper 1 in. square, is heated at about 100 deg. C. for 12 hours. If a dangerous proportion of sulphur is present, the copper will, on examination, be found to be discoloured with black copper sulphide.

Detection of Inorganic Acids.—Insulating oils should contain no inorganic acid. This may be detected by shaking a small quantity of oil, say, 50 c.c., with an equal volume of tepid distilled water to which has been added a few drops of methyl orange indicator. The water layer, after settling, will appear red in the presence of acid. In another test which has been recommended a sample of oil is shaken with roughly twice its volume of warm distilled water. The mixture is allowed to separate, and the oil is poured off and again shaken with twice its volume of warm distilled water and separated. The water solutions are then mixed, and the mixture can be tested for acidity with any good indicator, *e.g.*, tincture of cochineal: a few drops when added give a red indication in neutral solutions, yellow in acid and purple-violet in alkali.

Tests for Organic Acids.—Acidity in oils is generally due to partial decomposition of the oil, accompanied by the liberation of fatty acids, which act as corrosive agents. Properly refined mineral oils are entirely free from acidity, but nearly all vegetable and animal oils possess it in a varying degree. To test, about 10 gm. of oil are slightly heated with about 50 c.c. of pure, acid-free, 95-per cent. alcohol, and the liquid is agitated. When cool a few drops of phenol-phthalein is added, and the solution titrated with a centi-normal solution of potassium-hydroxide until the red colour appears. The number of milligrams of potassium-hydroxide required per gram of oil gives the acid number, which should not exceed 0.2 milligrams.

Saponification Test.—This gives the number of milligrams of potassium-hydroxide required to completely saponify the combined and free fatty acids. The reagents required are an approximately half-normal solution of hydrochloric acid, the exact value of which has been determined by titrating with potassium hydroxide, and an alcoholic solution of potassium-hydroxide containing 40 gm. of pure potassium-hydroxide in 1 litre of pure alcohol. One to two gm. of oil are placed in a flask fitted with a condenser neck, together with 25 c.c. of alcoholic potassium-hydroxide. The contents are boiled on a water bath until saponification is complete (generally about 15 min.). A few drops of phenol-phthalein indicator are then added, and the excess alkali titrated with the hydrochloric-acid solution. The standard of the potassium-hydroxide solution may vary somewhat, and in order to check this, it is necessary to heat another 25 c.c. of potassium-hydroxide for the same length of time as in the previous instance, and titrate it with the acid solution. The difference between the number of c.c. of acid solution used in the two tests is then expressed in milligrams of potassium-hydroxide, and calculated per gm. of oil gives the saponification number.

Viscosity.—This is a comparative test embodying the measurement by the rate of flow of the oil through a given orifice. It is really an indication of thickness, as opposed to fluidity, of the oil. Temperature is a very important consideration. Viscosity is usually measured by some form of commercial testing apparatus such as Redwood's Viscosimeter. Viscosity is not of great importance with transformer oils, since the internal heating will soon render the oil thin enough for efficient circulation. With switchgear the conditions are entirely different, and the thickness of the oil may seriously affect its arc-quenching abilities. For a like reason the freezing point is an important consideration for switchgear likely to be exposed to low temperatures.

Tests for Resins.—Incompletely refined oils easily resinify. Resin may be detected if a sample of oil is shaken with a quantity of boiling water and held at 100 deg. C. for some time. Its presence is indicated by the precipitation of fine white granules at the point of separation of the oil and water.

Flash Point.—This is the temperature at which the oil gives off inflammable vapours, and is important on account of fire risks. It is usual to check the flash point with some form of recognised closed testing apparatus, *e.g.*, the Pensky-Martens flash tester. The following would doubtless not be notable for accuracy, but it has been suggested as a substitute, should a commercial testing apparatus not be available. It should succeed in detecting an oil with a dangerously low flash point. A sample of oil is placed in a porcelain crucible which is heated on a sand bath. The crucible is covered with a piece of tinplate in which are two small holes, one for a thermometer and the other as a "touch" hole. At, say, every 10 deg. C. above 130 deg. C. a lighted match is inserted in the "touch" hole; when the first faint explosion of mixed oil-vapour and air occurs, the flash point is indicated.

Sludging.—The formation of sludge is not of as great importance with switchgear as with transformers, since with the former the oil must be periodically cleaned. With transformers, however, the matter is different; as long as moisture is kept out of the oil, the life of transformer oil is indefinite. So-called non-sludging oils are more expensive than those with a greater sludge tendency, since they must be better refined. It has been found that the deposit of sludge is chiefly composed of oxidisation products, the copper apparently acting as a catalytic agent and accelerating the deposit. In order to reduce the possibilities of oxidisation, oil tanks should be air-tight, and apart from electrical considerations, corona, and the consequent formation of ozone should be rigorously avoided, since ozone is a very powerful oxidising agent.

The following non-sludging test has been approved by B.E.S.A. Specification 148—1927; Pure dry air is passed through 100 c.c. of oil at the rate of 0.07 cu. ft. per hour (about 3 bubbles per sec.), the oil being heated at 150 deg. C. in a 200-c.c. flask. The flask should also contain a piece of polished copper of 5 sq. in. surface area, and the heating should continue for 45 hours. The deposit may be weighed after filtering and washing with petroleum spirit, and should not exceed 0.1 per cent. for Class A and 0.8 per cent. for Class B of the original weight of oil (100 c.c.).

Filtering.—Dust and other suspended foreign matter may usually be removed by filtering through some finely woven linen.

It will be seen that some of the foregoing are standard oil tests, applicable to all types of oil (lubricating, &c.). Most of them are fairly simple, and could be undertaken by most test departments. It is possible that some of the more complicated tests (sludging, saponification, and so on) would have to be taken for granted, although reagents could be purchased ready prepared, and thus save some trouble. If the simpler tests were carried out systematically and periodically, it would then be possible to state something definite regarding one vulnerable point, when trouble occurs.

Salesmanship Abroad.

WHEN the same old advice has been given in the same old way during a period of many years, the same old listener hardens his heart and, with a superior air, passes on his way But some of the old things have to be constantly reiterated because they are true and have been ignored, though they are matters of first importance. For more than twenty years we have advocated here that British foreign traders should make a closer and more specialised study of overseas markets—their language, temperament, art, literature, and all that goes up to make what we call "customs and conditions." Editorially, and from the pens or mouths of expert observers in various markets, has the counsel come, and we have done our best to trumpet it forth, hoping to influence the minds of men engaged in planning a trading policy for electrical export firms. But personnel changes are always taking place, and new firms or companies are continually coming into a developing industry; so, after all, it may be necessary and quite justifiable to repeat the same old truths again and again, even after the lapse of years. The British electrical export trade has made such great progress that it would be absurd to suggest that such advice has not been acted upon. It has happened that special efforts or campaigns made in a particular market, or several markets, have been permitted to run their course, produce their volume of business, and die out instead of being persistently continued. New men have come along and other measures have been recommended or taken, but the world has undergone such marked changes that there is ever need for these and other new men who will adopt new ways adapted to changing market conditions and requirements. To all such men connected with the electrical

industry we would pass on the advice given by Sir Malcolm Robertson, British Ambassador to Argentina, who is shortly leaving for Buenos Aires, before the Incorporated Sales Managers' Association. He is hardly what we should describe as a "new" man, seeing that during the last thirty years he has held sixteen different posts in twelve different countries, but it is worth while passing on to this generation from him, as a man of varied yet also up-to-date experience, what we passed on to an earlier generation in these pages, both editorially and from other students of the situation, the warning that other countries make a great effort to extend their knowledge of the language, art and literature of foreign countries largely for the purposes of commerce. When he says, however, that "we" have made no such efforts in such directions, but are beginning to do so, we wonder whether he does not condemn too hastily. He admits that to-day we know better than we used to do how to sell our goods, and if he noted in particular the progress of our electrical export trade he might give us credit for knowing our task fairly well. While we support Sir Malcolm's appeal for a greater all-round salesmanship effort and for British propaganda in the Argentine as means of spreading our trade abroad and regaining the old position, we may not agree so completely with him when he suggests that foreign competition can be beaten by British traders if they will only go to the markets. He wants to see more "merchant adventurers," and says that the spirit of fear that we cannot compete must disappear. This sounds all very light and easy and encouraging for consumption at a modern salesmanship luncheon where one expects to hear generalities rather than specialised advice; but we are afraid it only applies in small part to the electrical trade where our large manufacturing concerns have had to think deeply regarding such matters as relationships between themselves and their competitors, both at home and abroad, as measures for avoiding ruinous competition.

The productive capacity of the world is still largely in excess of consumption; many world development schemes need to be proceeded with and the purchasing power of peoples restored or increased beyond its previous proportions. From time to time we have evidence of gratifying activity on the part of British financial and engineering groups which render big overseas schemes practicable and work-producing; one such project for Baghdad has been recently the subject of negotiation and settlement. This is "salesmanship" of a very high order—sometimes it is exclusively British, at others it is found desirable to act in co-operation with financiers and groups representative of electrical competitors in other countries. In whichever category it falls, such enterprise is very welcome, but while world production capacity so greatly exceeds immediate demand, keener salesmanship of the old sort is hardly separable from unprofitable competition. Electrical men are not going to imagine that mere visitation of a market is sufficient for securing the sale of their product. Go they must if they are to be in the running at all, and every legitimate weapon of trade salesmanship must be employed, but many other things as well will have to done; they must prepare to meet competition in many shapes and forms, or else arrive at international understandings.

The International Illumination Congress.—II.

An Account of the Tour in the United States, and the World Congress at Saranac.

(By OUR OWN CORRESPONDENTS.)

IF the organisation of this Congress can be accepted as an index of American hustle, it can be stated with safety that the speed has been reached beyond which the human machine cannot endure. From early morning to late night the delegates are being whirled from place to place at such a breathless rate that one's mind becomes confused and quite incapable of sorting out the various places and matters of interest that have been made available for inspection and examination. In these circumstances the task of a recorder is not an easy one. If he makes the visits there is no time to report them, if he stays behind there is nothing to record. To write at the end of an American Congress day is a physical impossibility. A rare and welcome relief to-day enables us to record a few impressions whilst the main party is either playing or watching a golf contest. It should be stated at the outset that the arrangements for the tour are a triumph in organisation. Mr. Julius Daniels, chairman of the Congress committee, and the men who have so enthusiastically supported him, have excelled themselves in their efforts to make the meeting both enjoyable and profitable to their visitors. To mention by name all the individuals, both ladies and gentlemen, who have helped to entertain and instruct us would fill a page of the ELECTRICAL REVIEW, and is therefore impracticable. But they would all agree that Mr. George Merrill, chairman of the tour committee, should be specially complimented and thanked for his remarkably efficient organisation and untiring energy. About 75 delegates, representing most of the principal countries of the world, registered at the Hotel Astor, New York, on September 4th. It was there that we received our first surprise. Each visitor was presented with a leather-bound, loose-leaf book with his name embossed on the cover. For each day information and instructions concerning the tour were given in the minutest detail. We were given the time to rise in the morning,

Fig. 1.—New York Police Escorts.

full instructions concerning baggage, times of trains, the programme in each city hour by hour, names of hosts, maps, historical notes on places visited, engineering data, and a host of other useful information. Even this was supplemented by further printed booklets and programmes prepared by each local committee in the various cities and handed to the delegates on arrival.

The official proceedings opened on September 4th with a luncheon at the Hotel Astor, when we were

welcomed by Mr. Clayton H. Sharp, president of the U.S. National Illumination Committee, who presided in the temporary absence of Mr. John W. Lieb. After a gracious speech of welcome from Mr. Sharp, and the thanks of the delegates presented by Mr. C. C. Paterson, we were taken in hand by Mr. Clarence L. Law, chairman of the New York entertainment committee, and what wonderful entertainment he provided for us!

Fig. 2.—The British Delegation on Board s.s. "Tuscania."

Fig. 3.—Mr. Clayton Sharp and Mr. Julius Daniels.

Mr. Law is undoubtedly a past-master in handling large delegations, and in some miraculous manner he succeeded in getting the whole party through the extensive New York programme without being more than 15 minutes late at any point. The first day was spent in visiting places of interest in the City. The visitors had a choice of three trips, to either the 14th Street station of the New York Edison Company, the Electrical Testing Laboratories, or a general inspection of New York City. In addition, shopping tours were arranged for the ladies. A real thrill awaited us as we moved off in the special 'buses. Special policemen (fig. 1), with revolvers and sirens, and mounted on motor cycles, had been provided as our escorts. The manner in which these remarkable men can clear a path through the congested New York traffic must be seen to be appreciated, and the experience of riding down Broadway at 35 miles an hour is something not easily forgotten. In the evening we were entertained at dinner at the Electrical Testing Laboratories, when we were fortunate in having Mr. J. W. Lieb as our host, who outlined the *raison d'être* and the work of the institution which he founded and of which he is so justly proud. The laboratories, which are supported by the Association of Edison Illuminating Companies, carry out tests and researches on everything used by the central stations, and have drawn up specifications which are used when placing contracts. A number of small laboratories are placed at the disposal of independent inventors to enable them to carry out, undisturbed, experiments which may ultimately prove of value to the electrical industry. Mr. Lieb, in his speech of welcome, addressed the delegates in French and German, and was followed by Mr. C. C. Paterson and Prof. J. Chappuis, who formally thanked our hosts for their kind reception. After dinner we once more boarded our 'buses for a tour of the Great White Way to inspect street lighting, signs, traffic control lighting, &c., and finally made an inspection of Roxy's Theatre, a really remarkable institution replete with all the very latest lighting and control devices. It was well after midnight before the thoroughly exhausted, but well pleased, delegates reached their beds on the opening day of the Congress. On the following day we set out accompanied again by our "traffic cops" for a tour through Westchester County to the Biltmore County Club, where we were entertained at luncheon by the Westchester Lighting Company, and welcomed by the president, Mr. E. H. Rosenquest. Thanks

Fig. 4.—Delegates to the International Illumination Congress, with Mr. Thos. A. Edison at his Laboratories, West Orange, N.J.

were returned by Mr. K. Lempelius, leader of the German delegation. After a most enjoyable trip through that really beautiful country, we arrived at the Half Moon Hotel at Coney Island. Our hosts, the Brooklyn Edison Company, in addition to providing a sumptuous meal, presented each guest with a packet of free passes to all the side shows in Luna Park. We had an opportunity of inspecting one of the branch showrooms of the Brooklyn Company before dinner, and the delegates much admired the suite of rooms which are used for demonstrating electrical appliances and lighting effects. Mr. C. L. Harold, sales manager of the company, was our official host, and gave us many interesting details of the magnitude and growth of the electrical industry in Brooklyn. In spite of the thousands of lamps which illuminate the amusements of Coney Island, it is the general impression of the British delegates that the lighting effects on Blackpool pleasure beach are much more imposing. On September 6th we visited the Edison Lighting Institute of the General Electric Company at Harrison, where we were received by Mr. G. Osborne, who gave us details of the growth of the incandescent lamp business in America. In 1910 the number of lamps sold for general lighting purposes, not including automobile and miniature lamps, was 80 millions in 1927 the total had grown to 317 millions. The total cost of light during a similar period had decreased by 50 per cent., although the general cost of living had increased by 60 per cent. The lighting load of the central stations is estimated at 20 per cent. of the total load and produces 68 per cent. of the total revenue. In the domestic field, 83 per cent. revenue is obtained from lighting, 13 per cent. from motions, and the remainder from other appliances. Following the address of Mr. Osborne, we were conducted through the Lighting Institute by Mr. A. L. Powell and his assistants, who presented a most remarkable display of lighting demonstrations. The main auditorium is equipped with revolving chairs, enabling the audience to swing round and inspect the various demonstrations as they are presented. Everything in the Institute is controlled by remote control switches. At the press of a button, doors open and close, windows shut, curtains are drawn, and an unlimited number of lighting effects demonstrated. Every conceivable piece of equipment in which a lamp is used is available for inspection and beautifully displayed. The *pièce de résistance* is the new device for demonstrating the uses of electric signs. At one end of the lecture theatre a large sized model of New York is presented. By the aid of a most ingenious combination of lamps, reflectors, dimmers and electrically-controlled "noises off," the speaker gave a realistic impression of a thunder storm followed by the lighting up of the City's signs, offices, shops, streets, &c. At the conclusion of the demonstrations, Mr. George Stickney outlined the progress of illuminating engineering during the last 30 years, and explained the efforts which the Lighting Institute is making to develop the cause of better lighting in America.

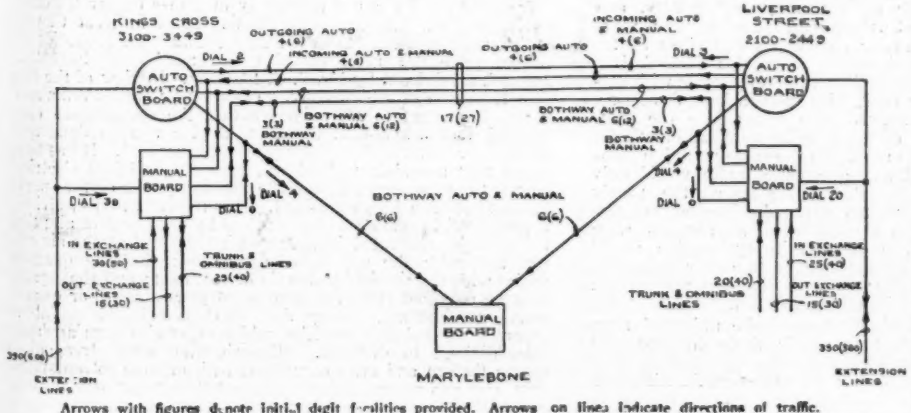
In the afternoon the party visited the Edison Laboratories, West Orange, N.J. Awaiting us in his private library was no less a personage than Mr. Thomas A. Edison. There has been no event in this memorable tour that has given the delegates more pleasure than having the privilege of shaking hands with the grand old man of the electrical industry. Although weak as the result of a recent illness, Mr. Edison roamed amongst us chatting freely and demonstrating a novel magnetic device on which he had recently been experimenting. It was obvious that the visit of such a distinguished body of lighting experts gave as much pleasure to Mr Edison as it did to the delegates who had the privilege and satisfaction of meeting him. The accompanying reproduction of a photograph taken outside the Edison laboratory will be a permanent record of a very memorable occasion.

Railway Automatic Telephony.

An account of the favourable results and savings effected by the installation of Relay automatic telephones at the London terminal stations of the London and North-Eastern Railway Co.

THE development of railway telephone facilities and the advantages of automatic switching were demonstrated last week on the occasion of an inspection of the new exchange system which has been installed by the Relay Automatic Telephone Co., Ltd., at the headquarters of the London and North Eastern Railway Co.

Mr. B. B. Johnson (chief engineer, Relay Co.), in outlining the merits of the system, said, *inter alia*, that the L.N.E.R. had adopted complete automatic operation between Liverpool Street and King's Cross stations, but a few operators had been retained at both offices (as is indicated by the accompanying diagram) to act as communal "secretaries" for extensions desiring to originate public exchange calls; they could also keep a record of all calls and, in addition, only allow authorised persons to originate public calls. In the general case, it was imperative to employ operators to answer incoming public-exchange calls, acting generally as commissionaires and assisting the public to obtain the correct departments. On the L.N.E.R. installation it had been found expedient to terminate the railway trunk lines, which included circuits to York and Edinburgh and the railway omnibus lines, on the manual board also. Of course, the omnibus lines could have been worked as automatic party lines, but the increased first cost would have been large, compared with the small amount of traffic per party line to be carried by the automatic exchange; when manual operators had to be provided and the special telephones already existed, the continuance of the established procedure undoubtedly had advantages. Again, whilst automatic working over long trunks was very satisfactory (as exemplified by the 280-mile line on the G.I.P. Railway of India from the Relay automatic exchange at Byculla to a manual exchange at Bhusaval, and by the automatic 120-mile trunk connecting their exchange at Allahabad to Lucknow) there were valid reasons for using operators if available. An automatic exchange provided for a non-delay service, and if a trunk lines was engaged at the instant that a demand was made for it, the exchange would truthfully report that the line was engaged; but it would not make a note of the number



Arrows with figures denote initial digit facilities provided. Arrows on lines indicate directions of traffic. Figures adjacent to brackets indicate initial equipment. Figures in brackets indicate the ultimate equipment

Fig. 1.—P.A.B.X. Network Diagram.

and ring the caller when the line became free, whereas an operator controlling a long and valuable trunk could make a list of waiting callers to be put through in order of their importance. Of course, that did not constitute a non-delay service, but the cost of providing a sufficient number of trunk lines to cater for the maximum demand for simultaneous conversations was usually out of proportion to the benefits to be obtained. In any case, the real advantage of automatic working could only be obtained by providing automatic exchanges at both ends of all trunk lines.

In the case of junction calls between manual and automatic exchanges, if at the conclusion of a call the automatic subscriber could replace his receiver and break away from the junction it would be possible for another automatic subscriber to obtain connection to the same junction before the operator had had time to remove her plug, which would cancel the junction-clearing signal without causing the calling visual to light. That difficulty could not arise if the clear was controlled by the operator. However, junction working between two manual exchanges was improved if one of the exchanges became automatic; the very marked improvement due to calls being handled by one operator instead of two was very evident whilst King's Cross was still working manually after Liverpool Street became automatic, and a similar improvement had been maintained on the Liverpool Street-Marylebone and King's Cross-Marylebone junctions. The particular arrangements on the Liverpool Street-King's Cross lines specified by the L.N.E.R. engineers were particularly good. The connecting junctions were divided into groups, some being used for automatic working only, some for manual working only, and some were available for both; those reserved solely for manual working were of much heavier conductors and allocated for long-distance traffic. The junctions were also divided into groups dealing, some with incoming traffic only, some with outgoing only, and a number dealt with calls in both directions. Single-way automatic junctions were taken into use first, and when they were all engaged, calls were automatically thrown on to the both-way group. In the same way, junctions available for both manual and automatic traffic would only be taken into use for automatic calls after all the purely automatic junctions were already engaged. The scheme provided was very flexible, and a number of alternatives were open to the extensions. The same both-way junction would accept (*a*) automatic to automatic calls in either direction; (*b*) automatic to manual calls; (*c*) manual to automatic calls; (*d*) manual to manual calls in either direction.

The manual board cord circuit was of the universal type, but rather more ambitious than usual: three different cord circuit conditions were provided, according to which type of line circuit the plug was joined to: (1) ordinary c.b. with positive lamp supervision; (2) magneto with ring-off relay controlling lamp visual signal; (3) automatic or manual public exchange with loop calling, which changes were all brought about automatically by the simple insertion of the plug, quite independent of any action of the operator.

Although the transfer was spread over a considerable period, the plant satisfactorily handled the situation.

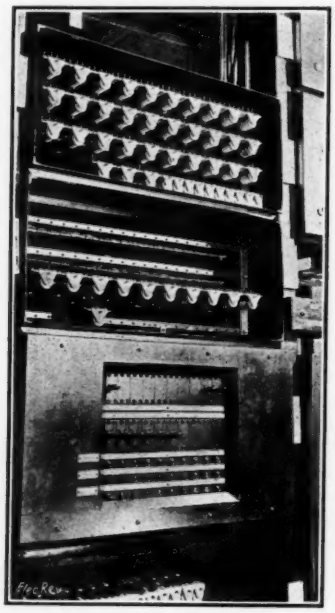
Mr. F. Downes (telegraph superintendent, L.N.E.R., Southern Area) expressed his absolute confidence in the system. The L.N.E.R., having no convenient route between its terminal stations to meet present requirements, a 27-pair dry-core paper-insulated cable had been laid over the Metropolitan Railway between Liverpool Street and King's Cross, the tie lines between King's Cross and Marylebone being still rented from the Post Office. The savings anticipated were being fully realised, both as regarded operating staff and maintenance, and also economies resulting in the smaller user of the Post Office system for which an increasing annual charge was obtaining.

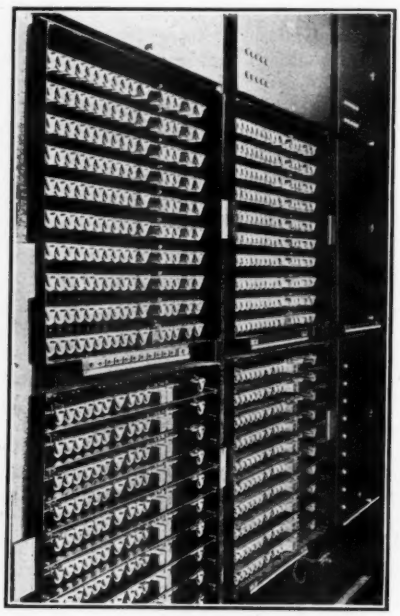
A feature of the Relay system was the thermostat arrangement for preventing (*a*) faulty lines occupying the automatic apparatus; (*b*) connecting a caller to the manual board should he fail to dial after removing his receiver; (*c*) or should the dialling not prove effective within 30 to 45 seconds. The auxiliary manual boards were of the latest P.O. standard type, with apparatus for dialling the Post Office automatic exchanges and also special keys for ringing on the long-distance railway trunk circuit; the speaking efficiency over the latter was very good, owing to the elimination of switchboard losses under the old arrangement. The number of calls dealt with by the automatic exchange now exceeded 3,000 per day. The apparatus at present installed allowed for 50 simultaneous conversations and 7 simultaneous diallings.

Regarding the power plant, electrical energy was supplied from the company's generating stations for charging the 32-volt D.P. accumulators. At King's Cross a motor-generator converted a.c. at 415 volts to d.c. at 40 volts. At Liverpool Street d.c. at 220 volts was reduced by motor-generator, and at Marylebone the energy was converted from a.c. 415 volts to d.c. at 30 volts for charging the 22-volt battery. The accumulators at King's Cross and Liverpool Street were 400 amp.-hour capacity duplicate sets.

The space available for the automatic exchanges was limited, and in considering competitive tenders that factor was of great importance. He was closely investigating the possibilities of extending the system for linking up important provincial centres for automatic working with headquarters, and observed that some features embodied in automatic telephony might tend to simplify future problems in automatic signalling for the control of train working.

Major W. Burningham White (general sales manager, Relay Co.), who presided at the subsequent luncheon, explained that thermal relay which had been mentioned was their patent solely; no other company used it. The railway company would save 13 per cent. on its annual telephone expenditure by installing the new plant, the upkeep cost of which was less than that of manual equipment. The Relay Co. had supplied 300 sets of P.A.B.X. gear for the Post Office; 90 per cent. of the number operating with the P.O. system (and 90 per cent. also of those which were not) were of the company's make. Relay equipment was being installed in a 2,500-line public exchange in Czecho-Slovakia, which would later be connected to six satellites; the company also had a fire-alarm system which enabled the ordinary telephone circuit wires to be used.





Figs. 2 and 3.—"Marker" (left) and Relay Racks.

Electrification of Coal Dust.

A recent publication of the Safety in Mines Research Board, paper No. 43, "Spontaneous Electrification in Dust Clouds, with special reference to Coal Dust Clouds" (H.M. Stationery Office, price 6d. net), contains the results of important research carried out by Mr. S. C. Blacktin. In view of the fact that the cause of some coal-dust explosions remains unknown, it was important to ascertain whether the spontaneous electrification of a coal-dust cloud could give rise to dangerous electric sparking, such as might ignite gas or dust. It has been found that a coal-dust cloud can generate sufficient electrical energy to produce sparks, but the igniting power of the sparks has not yet been fully examined. It is recorded that electricity is generated in coal-dust clouds raised by a current of air; that the quantity generated increases with the speed of the air current and with the weight of dust used; that the quantity varies with the particular sample of coal dust; and that sparks may be obtained from the charges so generated. For quantitative experiments, emery dust has been found useful to separate the coal dust particles, which otherwise form agglomerates difficult to disperse. Experiments with lycopodium spores (before and after extraction with organic solvents) and with rice and potato starches suggest that, other things being equal, the electricity generated per unit weight of material passed increases with decrease in the particle size; that is to say, the electrical charge increases either with increase of the surface area exposed or with increase of the number of particles used. This relationship has been confirmed for coals by showing that increase in the particle fineness due to grinding results in increase of electrical charge. It is shown that the relationship between the charge and particle size holds with elutriated samples of two American coals differing in fineness between known limits.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments. Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations and Failures.

The Factory Lighting Campaign.

Following the communication regarding the Factory and Workshop Lighting Campaign sent to 100,000 owners or managers on September 10th, another letter drawing attention to the standard lighting specification for various grades of work has been circulated. An offer of this and also of a representative to call and give information on the matter is contained in the communication.

The North-Western Area Committee of the Electrical Development Association has arranged a big programme of meetings in connection with the Campaign. Representatives of supply undertakings, electrical contractors, &c., have been invited to attend a sales conference at the Manchester headquarters, 4, Fountain Street, to-day (Friday), when Lt.-Col. Vignoles, director of E.D.A., will preside. Mr. R. C. Hawkins, the area secretary, will lecture to industrial consumers at the following meetings, organised by the various corporations:—October 12th, at Pattern Hall, Warrington; October 25th, at Liverpool Corporation Electricity Showrooms; October 31st, at Lancaster Electricity Showrooms; November 7th, at Birkenhead Electricity Showrooms.

The Post Office Foreign Contracts.

In *The Times* of October 2nd there appeared the following letter, signed by Mr. Ll. B. Atkinson, director of the Cable Makers' Association. It follows upon various statements regarding contracts for bronze wire placed with French and German concerns:—

"A large number of people have been shocked to learn that, at the moment when the Prime Minister had taken the unusual course of circulating employers urging them to employ more workpeople from the distressed areas, the Post Office should have placed considerable contracts for bronze wire in France and Germany. At the recent Conservative Party conference at Yarmouth this question was discussed, and Mr. L. S. Amery, Secretary for the Dominions, in a statement published in the Press and broadcast the same day to millions of people, excused this action on the ground 'that a Select Committee of the House of Commons investigated the question of Post Office cables some time ago, and came to the conclusion that the association or ring which controlled this country's cable production were asking excessive prices.'

"Part of this statement is misleading, part is not true, and the whole is so damaging to the cable-making industry that it must be refuted. In the first place, the Cable Makers' Association have nothing to do with the manufacture of bronze wire, which is the business of other manufacturers. This explodes the whole of the excuse. But, further, that part of the statement 'that the Committee came to the conclusion that the Cable Association were asking excessive prices for cables' is not a fact. The Committee made no such statement. They stated 'that the cables could be obtained from foreign manufacturers at considerably lower prices.' This is very different, and particularly in view of the evidence before the Committee. The Controller of Stores, questioned on the difference of price between foreign tenders and the association prices, replied to the effect that, allowing for the difference in labour costs here and abroad, there is not a big difference between them. Sir Evelyn Murray, Secretary to the Post Office, being asked whether the association were holding up prices, replied to the effect that he was not prepared to say that they were holding up prices or obtaining an excessive profit, but went on to say that the question was whether a Government Department should buy at home or in the cheapest market in the world. So that, even had bronze wire been made by cable-makers, the argument is based on a misstatement of fact.

"The replies quoted above only endorsed the conclusion arrived at by the Profiteering Committee which in 1921 investigated the relation of the Post Office to the Cable Association. This Committee, which included a retired Post Office official, stated, 'nor have we any evidence to point to any unreasonableness on the part of the association.'

"What is a reasonable profit may be debatable, but the fact remains that the profit made by the Post Office from the public on its capital is greater than the profit made by the cable-makers on their capital. Figures have recently been prepared in another connection by a well-known firm of chartered accountants for the years 1913, 1920, 1925, 1926 (representing pre-War, boom year, and recent years), which show that the total profits earned by the companies in the association were, respectively, 8.68 per cent., 9.8 per cent., 11.69 per cent., 9.44 per cent., on the total capital. The average is 9.92 per cent. In July last the Assistant Postmaster-General, in reply to a question, gave figures showing that the total profit of the Post Office on its capital is 10.8 per cent. The profit of the Post Office on its telephone business is higher than its average profit; the profit of cable-makers on Post Office business is lower than its average; which increases the difference shown."

Local Exhibitions.

Guildford.—The Corporation Electricity Committee has arranged to hold an electricity exhibition at the Drill Hall from October 10th to 20th and has voted £350 for this purpose.

Dunfermline.—An Ideal Homes Exhibition was opened at Dunfermline on September 26th. Two stands are occupied by the Fife Electric Power Co., which shows a wide range of domestic electrical appliances. Demonstrations are given daily of electric cookery. Messrs. James Scott & Co., a local firm, demonstrate radio apparatus and domestic appliances.

Upton-on-Severn.—A successful three-days' electrical exhibition was held recently by the Shropshire, Worcestershire and Staffordshire Electric Power Co. in pursuance of its policy of popularising electricity in rural areas. The exhibition was arranged in a large marquee, and a comprehensive range of domestic apparatus was shown and demonstrated. The company recently inaugurated a system of deferred payments whereby consumers have the choice of two methods, one by quarterly payments, and the other through a prepayment meter at a small additional charge per kWh consumed.

Birkenhead.—The Electricity Committee last week held in the Town Hall an exhibition of domestic electrical apparatus and gave demonstrations of the numerous applications of electricity.

Tunbridge Wells.—An exhibition of electric cooking, heating, and domestic appliances is being held from October 4th to October 13th at the Calverley Grounds Pavilion, Tunbridge Wells, and a number of local electrical firms are making special displays.

New Zealand's Electrical Imports.

The *Board of Trade Journal* states that during the last June quarter New Zealand imported electrical machinery and equipment to the value of £501,368; this was by far the most important item in the list. The bulk of the goods (value £296,605) came from the United Kingdom. The share of the United States was valued at £84,094, Canada's at £34,679, and Australia's at £8,644.

United States Electrical Exports.

The United States electrical export trade continued its upward trend during July, when the total value was $9,920,208, as compared with $8,470,724 in July, 1927. Some of the most important increases occurred in the following classes: D.c. generators, from $88,421 to $190,139; switchboard panels, from $113,241 to $258,509; switches and circuit breakers over 10 A, from $140,705 to $180,188; portable electric tools, from $66,518 to $127,733; therapeutic and X-ray apparatus, &c., from $116,453 to $165,022; radio receiving sets from $185,079 to $377,087; ignition apparatus, from $172,932 to $264,605; unspecified electrical apparatus, from $587,596 to $805,064; bare copper wire, from $126,367 to $509,216; domestic washing machines, from $85,260 to $189,014; and refrigerators up to 1-ton capacity, from $368,942 to $575,748. The last item retains its position as the most important class of electrical exports. Among the largest decreases were: A.c. generators, from $119,695 to $39,807; fractional h.p. motors, from $301,669 to $264,659; railway motors, from $146,878 to $10,179; railway signalling apparatus, from $113,590 to $65,904; carbon products, other than furnace electrodes, from $112,968 to $53,429; and insulated copper wire and cable, from $544,326 to $394,373. Canada, whose share amounted to $2,605,902, was again the principal customer. Next in order were Argentina ($674,049), Australia ($640,251), the United Kingdom ($639,634) and Japan ($574,459). The value of electrical goods imported by the United States during July was only $161,535, lamps of various kinds accounting for about $100,000.

New Catalogues and Lists.

Messrs. Brierley, Sons & Co., School Street, Newton Heath, Manchester.—An illustrated brochure entitled "Modern Methods of Dust Removing," dealing with the company's fan installations and auxiliary plant.

Messrs. J. G. Statter & Co., Queen Anne's Chambers, Westminster, S.W.1.—Leaflet No. X202, illustrating and describing switchboard type oil switches for pressures not exceeding 3,300 V. Also an October calendar-blotter.

The Edison Swan Electric Co., Ltd., 123-5, Queen Victoria Street, E.C.4.—Pamphlets dealing with the construction of the company's 3-valve receiving sets. These are very ingenious, consisting of folding photogravure illustrations of the arrangements, actual size. A separate pamphlet contains full instructions for assembling and operating the sets.

The General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.—The "Osram-G.E.C. Bulletin" for September, containing illustrated articles and notes upon "Osram" lighting installations, the company's radio apparatus, domestic appliances, &c. Three well-illustrated pamphlets dealing respectively with the "Electric Wizard," "Magnet" household appliances, and "Magnet" fires. Priced. Also a large sheet containing illustrated instructions for building the "Music Magnet" screened-valve receiver. Prices of the necessary components are given.

Messrs. John Moores & Co., Ravald Street Works, Salford.—Price List No. 928—insulating tapes, compounds, ebonite, micanite, &c.

Furse Wholesale, Ltd., Traffic Street, Nottingham.—List No. 22/28, containing net trade prices of electrical supplies of all kinds.

Messrs. S. Rogers & Co., 15, Fitzroy Street, Tottenham Court Road, W.1.—October calendar-blotter advertising the company's installation business.

W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.—Folder No. 306, advertising "Herculene" tough non-hygroscopic insulating material for cables. The folder is printed in colours with special new process half-tone blocks on cartridge paper, giving a very pleasing effect.

Mr. Alan Wright, 124, Chancery Lane, W.C.2.—An illustrated and priced catalogue of "Inventum" electric heaters.

Messrs. Warren Bros., Ltd., 91 & 93, Grange Road, Middlesbrough.—A booklet and a calendar-blotter advertising the company's steam separators.

The Mortimer Engineering Co., Ltd., 35 & 36, Aldermanbury, E.C.2.—An illustrated sheet and accompanying particulars and prices of worm reduction gear boxes and revolving window platforms.

Switchgear & Cowans, Ltd., Old Trafford, Manchester.—Descriptive Section No. 26, illustrating typical examples of the company's switchboard installations.

Messrs. Ferranti, Ltd., Hollinwood, Lancs.—Leaflet Wa416, dealing with the use of the company's components in the construction of h.t. radio supply units.

The Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester.—A large collection of revised catalogue leaflets dealing with many of the company's productions.

Messrs. L. Andrew & Co., 2, Whitworth Street West, Deansgate, Manchester.—A price list of "Wrendal" metal-filament lamps.

The Cooper-Stewart Engineering Co., Ltd., 136-137, Long Acre, W.C.2.—A well-illustrated price list of irons, grillers, geysers, and other domestic appliances. Also particulars of a free gift scheme.

The Lunken Co., Ltd., 35, Great Dover Street, S.E.1.—An illustrated price list of stationary and marine tachometers.

Messrs. Baxter & Caunter, Ltd., 219, Tottenham Court Road, W.1.—September price list of electrical appliances and accessories.

Messrs. Siemens Bros. & Co., Ltd., Woolwich, S.E.18.—A 134-page catalogue (No. 500) of telephones and accessories. This contains a great deal of illustrated information upon the company's automatic exchanges and a wide variety of instruments and equipment.

Messrs. John Bell & Croyden, 50, Wigmore Street, W.1.—An illustrated list dealing with the "Arnold" "Alpine Sun" lamp and other appliances for artificial sunlight, ultra-violet and infra-red radiation. Priced.

British Insulated Cables, Ltd., Prescot, Lancs.—List P.241—a list of cables supplied for working pressures of 66 and 33 kV.

Messrs. Poynter, Griffiths & Co., Ltd., Maxim Lamp Works, Canonbury Road, N.1.—A blotter and a price list of "Maxim" lamps of various patterns.

Messrs. Edward Bennis & Co., Ltd.—Two illustrated brochures dealing, respectively, with the company's boiler house elevators and patent coking stoker (and self-cleaning natural-draught furnaces).

Railway Electricians' Wages.

On October 11th the Industrial Court is to consider an application by the railway companies for sanction to a "cut" of 6s. per week in the wages of railway electrical workers. These men were not involved in the recent voluntary reduction in the wages of railway employés.

Bankruptcy Proceedings.

Timothy Barnett, 934, Woodborough Road, Mapperley, late of Sherwood and Stanton Hill, near Mansfield, Nottingham, electrical contractor.—The first meeting of creditors was held on September 27th, at the Official Receiver's offices, Nottingham, when Mr. Robert Rhodes was appointed trustee, and a committee of inspection was elected. It was stated that debtor commenced business on his own account in 1924 with from £100 to £150 borrowed capital. For some time he took about £20 a day, making 25 per cent. profit, until there was a slump in the wireless business. Subsequently he opened other premises.

R. B. Lawson, Bare, Lancs., electrical engineer.—This debtor appeared for examination at the Preston Bankruptcy Court on September 28th. The statement of affairs showed gross liabilities of £157 and assets estimated at £46. Debtor attributed his failure to want of capital, insufficient profits to meet expenses, loss of £20 under a contract, and a bad debt of £80. The examination was adjourned.

F. J. Welberry, electrician, Seathorn Estate, Skegness, Lincs.—The first meeting of the creditors was held recently at the Official Receiver's offices, 10, Bank Street, Lincoln. The statement of affairs showed gross liabilities of £54, and there were no assets. The estate was left in the hands of the Official Receiver.

Excel Radio Components, manufacturers of wireless sets and components, 53, Abingdon Street, Northampton.—Receiving order made September 21st on a creditor's petition.

D. M. Strode, engineer, 46 and 48, Osnaburgh Street, N.W.—Bankrupt discharged subject to consenting to judgment for £100 being entered against him by the Official Receiver (£100 paid to the Official Receiver in lieu of entering up judgment).

L. A. N. Dixon (C. Forgham & Co.), electrical engineer, 23a, Princess Street, and Old Post Office Yard, Shrewsbury.—Last day for proofs for dividend October 10th. Trustee, Mr. C. J. Pyke, Official Receiver, 22, Swan Hill, Shrewsbury.

A. M. Edwards (Mansell, Edwards & Co.), electrical engineer, 111b, High Street, Blackwood.—Last day for proofs for dividend, October 10th. Trustee, Mr. E. Owen, Official Receiver, 34, Park Place, Cardiff.

H. N. Shorrock, electrical engineer, Hollings Yard, Horsham Road, Morecambe.—First and final dividend of 3s. 0½d. in the £, payable at the Official Receiver's offices, 9, Cannon Street, Preston.

H. L. Smith, electrician, 156, Tredegar Road and 10, Ordell Road, Bow, E.—Trustee, Mr. D. Williams, Official Receiver, Carey Street, W.C., released September 24th.

Company Liquidations.

Russell & Co. (Engineers), Ltd., 9, Lancashire Court, New Bond Street, W.1.—A meeting of creditors was held on September 27th, when a statement of affairs was submitted which showed liabilities of £3,761 and net assets of £1,359, leaving a deficiency as regarded the unsecured creditors of £2,402. The issued capital of the company was £2,000, making the total deficiency £4,402. The liquidator, Mr. R. C. Taylor, reported that the business was commenced in 1888, and the company was actually formed in 1910. He reviewed the company's accounts from the year ended January, 1921, up to the year ended January last. It was decided to confirm the voluntary liquidation of the company with the present liquidator, and a committee of inspection of three of the principal creditors was appointed.

Lincolnshire Motor & Electric Traction Co., Ltd.—A meeting of members is called for November 1st, at No. 1, Town Hall Street, Grimsby, to hear an account of the winding up from the liquidator, Mr. A. G. Pearson.

Re-Echo Radio Co., Ltd.—A meeting of members is called for November 1st at 6, Charing Cross Chambers, Duke Street, Adelphi, to hear an account of the winding up from the liquidator, Mr. C. H. Whatley.

Neutron, Ltd.—First dividend of 9d. in the £, payable at 40-43, Norfolk Street, W.C.2.

Dissolutions of Partnership.

J. Webster, electrical engineers, 65c, Moss Lane, Orrell Park, Liverpool.—Messrs. Joseph & John Webster have dissolved partnership. Mr. Joseph Webster will attend to debts and continue the business.

The Clifton Electrical and Automobile Engineers, 48, Broadway, Cardiff.—Mr. T. Thomas and Mr. C. C. Taylor have dissolved partnership.

T. Horn & Co., electrical and wireless engineers and suppliers, 5, Harrogate Parade, Moortown, Leeds.—Mr. A. W. Kay and Mr. T. J. Horn have dissolved partnership. Mr Horn will attend to debts and continue the business under the same style.

New French Companies.

The Société Rurale d'Energie Electrique des Ardennes is the name of a new concern which has been formed in Paris (67, Rue de Chabrol) with a capital of three million francs, to establish an electricity supply distribution system in the rural districts of the French Ardennes.

La Société des Lampes Molnia has been formed in Paris (41, Rue Vital), with a capital of 1,500,000 fr., to carry on the manufacture of "Molnia" (Ferrette patent) electric lamps.

Proposed Cable Works in Poland.

It is stated that the Felten and Guilleaume Company, Cologne, is endeavouring to extend its Polish interests by the formation of a Polish company with a capital of 8,000,000 zloty for the production of cables in that country.

A Callender Tableau.

We reproduce herewith a photograph of a tableau entered in the recent Swansea Carnival by CALLENDER'S CABLE & CONSTRUCTION CO., LTD. A small room was represented to adver-

A Callender Tableau.

tise the simplicity of the "Kaleeco" wiring system. On the driver's cab were boards bearing a selection of fittings employed with the system and sections of Callender cable. On the bonnet were a number of reels of wire. The exhibit was awarded a diploma of merit in the special class, gaining the first prize.

Berlin Contract for British Firm.

It is interesting and pleasing to learn that Messrs. NEWTON BROTHERS (DERBY), LTD., have just secured an order from the German State Telegraphs, Berlin, for a 50-kW, 10,000-volt direct-current generating set. It is to be motor-driven and similar in type, size and voltage to the sets designed, manufactured and installed at the British Broadcasting Station, 5GB, Daventry, and the Marconi Beam Radio Station, Dorchester.

Trade Announcements.

Messrs. GILBERT GILKES & CO., LTD., of Kendal, and JAMES GORDON & CO., LTD., of Kingsway, London, have amalgamated their businesses, so far as the manufacture and supply of water-power plants and hydraulic work generally is concerned, as from April 1st last, under the title of "Gilbert Gilkes & Gordon, Ltd." Messrs. James Gordon & Co., Ltd., will continue their business as combustion engineers at Windsor House, Kingsway, as heretofore, and the London office of Gilbert Gilkes & Gordon, Ltd., will now be at the same address.

Messrs. W. T. GLOVER & CO., LTD., have notified us of the new addresses of their following branches:—Leeds: 13, Park Square; Birmingham: 17, Summer Row; Liverpool, 17a, South Castle Street; and Cardiff: 19, St. Mary Street.

The FREEMAN ELECTRICAL CO. has removed to 157, Whitechapel Road, E. (Telephone: Bishopsgate 7311.)

ELECTRICITY SERVICES, LTD., and its associate, the TYPERLITE CO., have removed to more commodious premises at 86, Cannon Street, E.C.4. (Telephone: Mansion House 5294.)

In our "New Companies" section to-day the registration of E. R. MORTON, LTD., is recorded. The company has been formed by Mr. E. R. Morton, who left the Sun Electrical Co., Ltd., two years ago to inaugurate the sales department of Kelvinator, Ltd. During the first twelve months over 120 depôts were established throughout the British Isles. The new company is to give special attention to the sales development through the electrical trade of a limited number of electrical and radio products. The company's address is 117, Charlotte Street, W.1.

The FLEET ELECTRIC SERVICE, electrical engineers and merchants, of 26, Ivy Lane, Newgate Street, E.C.4, have taken larger premises at 8 and 9, Ivy Lane.

Mr. Percy Levy has retired from the board of ELTON, LEVY AND CO., LTD., metal merchants, &c., and has severed his connection with the company. Messrs. F. W. Tilly and R. H. Harries have been elected directors, and Mr. E. E. Stenner becomes secretary in place of Mr. Tilly. The company's address is now 30-36, Chartehouse Chambers, London, E.C.1.

Social Events.

The 1928 series of golf competitions organised by the staff of Siemens Lamp Works, Preston, was brought to a successful conclusion on September 15th, by an "Eclectic" competition for the "A. M. Hicks" prize. The competition was played over the Ashton Park course and was won by H. Ruddick with an eclectic score of 43-7-36, W. G. Creasy being second with 46-9-37.

Venner Time Switches Sports Club members and friends met at the Caxton Hall, Westminster, on September 27th, when they held their first dance and whist drive. The whole affair went off with the usual *éclat*. The directors, Mr. R. C. Graseby and Mr. E. E. Sharp, with Mrs. Graseby and Mrs. Sharp, attended and officiated at the distribution of prizes. The new vice-president of the Club, Mr. F. Selley, of the St. Marylebone Electricity Department, and Mrs. Selley, were welcomed. Financially, as well as socially, the affair was a great success, and the Club soon hopes to have its own sports ground instead of the present temporary one at Edgware.

The first annual competition for the Agricultural Engineers' Association trophy presented by the president (Mr. G. E. Rowland) was played on the Aldeburgh Golf Course on September 22nd. Twenty-four cards were returned. The winner was Mr. A. V. Thurston.

The annual bowling match, "East" *v.* "West," of members of the Electrical Contractors' Association of Scotland took place on the Shawlands Green, Glasgow, on September 14th, and resulted in a heavy win for the West. This is an old-standing engagement, and is held every year for a trophy which was presented by Mr. T. B. Wright, of Glasgow, in memory of his father, the late Mr. Thomas Wright, the first president of the Scottish Association. During the whole period of the contest this trophy has been won by the Western team.

A Moscow Tube and other Russian Concessions.

The Berlin correspondent of the *Morning Post* reports that the Soviet Government has decided to proceed with the building of Moscow's first underground railway, which is to cost £2,000,000, and to be completed with the aid of German and American firms in three years. Simultaneously the Russian Concession Committee has published the complete conditions on which foreign concessionaires are to be invited to take up concessions in accordance with the new policy of attracting capital to the country by this indirect means. Foreign capital, it is announced, is required to the extent of £40,000,000 for the development of public services in 60 principal cities from Leningrad to Tiflis, as the towns are growing too fast for their needs to be met by the resources of inland capital. Concessionaires will have a monopoly in their several spheres on the understanding that they carry out their operations as cheaply as possible.

Picture Gallery Illumination.

An entirely new method of illumination has been adopted recently by the Parker Picture Galleries, Berkeley Square, W., incorporating "Gecoray" silvered glass reflectors. The richness of colouring and vigorous composition of the exhibits demands the most perfect lighting for true effect. The silvered glass reflectors are equipped with "Pearl Osram" gasfilled lamps, and, as will be seen from the accompanying illustration (from an untouched photograph taken solely by the aid of the lighting), the even illumination of the pictures reveals every detail of the artists' work with freedom from shadow

The Lighting of a Picture Gallery.

or distortion. The system of tilted suspension by counterweight and cord, aided by a special method of support, permits easy manipulation of each unit. In all, some 24 of these units are used for the picture lighting, the main lighting being carried out by means of G.E.C. 24-in. ogee dustproof pendants

equipped with gasfilled lamps. The installation was carried out by Messrs. E. Wight & Co., Finchley, who employed "Magnet" conduit, G.E.C. fuseboards, switchgear, and accessories.

New Showrooms at Leeds.

New and well-equipped showrooms were opened in Albion Street, Leeds, last week, by the Corporation Electricity Department. The new premises, replacing the showroom in Whitehall Road, are a six-storey building. The basement will be used for goods; on the ground floor is a spacious lounge showroom; above this is a lecture and demonstration hall equipped with a kinema; and the top floor will be used as a repair shop for cookers. The building was opened by the Lord Mayor with a gold key, handed to him by Ald. Foster, chairman of the Electricity Committee.

A "Cosmos" Lamp Display.

The accompanying illustration shows an attractive display in one of the windows of the showrooms of Metro-Vick Supplies, Ltd., Charing Cross Road, W.C.2. A feature is made of the recent reductions in the prices of lamps and the centrepiece

A "Cosmos" Window Display.

consists of a large representation of a "Cosmos" lamp above a lighted house. Examples of the lamps are distributed about the window, and there are a few examples of the company's lighting fittings arranged here and there.

Polish Tariff Reductions.

The *Board of Trade Journal* for September 27th reproduces a list of reduced import duties which have been put into force by Poland under an agreement with Czecho-Slovakia. Among the items in the list are the following: Electrical machinery: Dynamos, motors and transformers: Over 15 kg. up to 150 kg., 476.10 zlote per 100 kg.; over 150 kg. up to 500 kg., 362.25 zlote per 100 kg. Complete telephone apparatus: Telephonic apparatus and switchboards—automatic system, 500 zlote per 100 kg.; "telephonic apparatus in cages for mines, foundries and railways," 310 zlote per 100 kg. Telegraphic apparatus (tapping apparatus), 610 zlote per 100 kg.

Birmingham Electric Club.

The Annual Ladies' Evening will be held at the Grand Hotel, Birmingham, on Friday, October 19th. Tickets, 12s. 6d., inclusive of supper, can be obtained from Mr. F. C. Hall, honorary social secretary, 33-34, Paradise Street, Birmingham.

Unemployment.

There was a fall of 6,280 in the number of registered unemployed during the week ended September 17th. The total at that date was 1,293.700, as compared with 1,299.980 on September 10th and 1,047,990 on September 19th, 1927.

For Sale.

Mr. H. J. Shaw will sell by auction on October 9th, at 47-49, Newman Street, W., a large and varied stock of electrical and wireless accessories, &c., and on October 11th, at 13, High Holborn, various trade stocks of wireless and electrical goods. (See our advertisement pages to-day.)

An "Underground" Poster Exhibition.

An exhibition of posters issued by the Underground Companies during the past 20 years was opened at the New Burlington Galleries, Burlington Gardens, W.1, on October 3rd. Over 200 posters are on view, representing about one-fifth of the total number of pictorial posters issued since 1908. Nearly 100 artists have contributed towards a unique collection, and the progress in poster art from the first year to the futurist designs of 1928 is most marked. Over 4,000 sites on the underground railways are reserved for posters, but as the average "life" of a poster is only a month, the public is not allowed to weary of them. The exhibition, to which admission is free, will remain open from 10 a.m. to 5 p.m. daily (except Sundays), until October 20th.

Book Notices.

Publications of the Association of Engineering and Shipbuilding Draughtsmen.—"The Operation of Single-Phase Induction Motors." By G. Windred. Price 2s.

"*Journal* of the American Institute of Electrical Engineers." Vol. XLVII. September, 1928. No. 9. New York: The Institute. Price $1.

"Electrical Transmission and Distribution." Edited by R. O. Kapp, B.Sc.—This work, which will be published in about 30 parts (price 1s. each) by Messrs. Sir Isaac Pitman and Son, Ltd., commencing on October 16th, covers such subjects as overhead lines, underground mains, sub-stations, transformers, switchgear, and so on.

"Electricity." By S. E. Clotworthy, B.Sc. Price 1s. net. The Richards Press, Ltd.—This is Part No. 12 of the "Modern Pictorial Library," edited by S. P. B. Maiz, M.A., which aims at an ideal and novel combination of a series of pictures, with an informative text.

A Radio Apparatus Hire-Purchase Agreement.

We have received from Metro-Vick. Supplies, Ltd., a copy of a form of agreement which it has prepared for the use of dealers in arranging for the hire-purchase of "Metro-Vick" radio apparatus. The agreement is in simple terms, and at the end of the form particulars of deposits and payments are given. The company has also sent us a window bill which draws attention to the scheme.

Luxemburg Contract Conditions.

The Compagnie Grand Ducale d'Electricité du Luxembourg, in announcing that it would shortly invite tenders for the supply of (1) a number of transformers, and (2) underground cables, and (3) bare conductors (some of copper and some of aluminium) required for the Luxemburg electrification scheme adopted a somewhat unusual course of action. All firms intending to submit tenders were required to send in by September 28th, a certificate showing how within the last two years they had fulfilled their engagements in respect of contracts, a list, by way of references, of the contracts that they had completed approaching in importance those about to be given out; copies of official certificates or documents showing the results of tests of material similar to that required; and complete references as to their financial stability.

"More Power to the Home!"

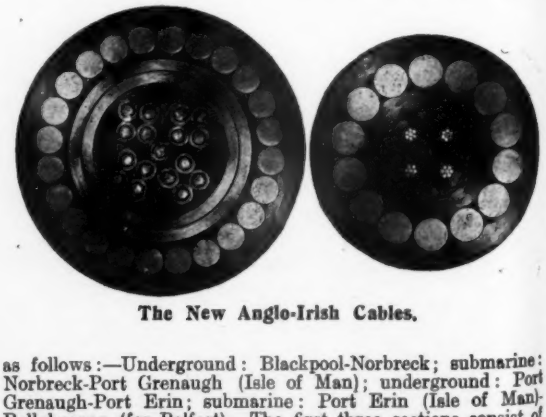
We have received from the National Electric Light Association, of New York, copies of six excellent illustrated booklets full of useful literary matter, bearing the above title. They range in length from 24 to 44 pages, and each has a plain cover of a different colour. Their sub-titles, in addition to the main title of "More Power in the Home," are as follow:—

Wiring the House.
Better Lighting (Light the First Home-builder).
Washing—Electric Water Heating.
Ironing.
Many Motors Make Light Work.
Electric Range Cookery.

The booklets have been prepared by the Women's Committee of the Association for their members in their studies of the application of electricity to housekeeping purposes, and in addition companies are distributing them to groups interested in the "Better Homes" movements, club women and teachers and students of home economics, also by sales organisations, and home service directors. Three other booklets are being prepared: "Small Appliance Cookery," "Refrigeration," and "Miscellaneous Electrical Household Devices."

Recent Contracts.

The contracts for a new Anglo-Irish telephone cable have been placed with Messrs. Siemens Bros. & Co., Ltd. The contracts provide for the manufacture and laying of cables



The New Anglo-Irish Cables.

as follows:—Underground: Blackpool-Norbreck; submarine: Norbreck-Port Grenaugh (Isle of Man); underground: Port Grenaugh-Port Erin; submarine: Port Erin (Isle of Man)-Ballyhornan (for Belfast). The first three sections consist of four quads of continuously-loaded conductors, paper insulated, the submarine section being double lead-cased and armoured. For the other section, provision is made for two 4-core cables

insulated with special low-leakance material. The programme provides for the laying of all three cables by the c.s. *Faraday* by June next. The two types of cables are illustrated herewith.

As we reported in our last issue, the English Electric Co., Ltd., has sent us details of recently-secured contracts having an aggregate value of about £250,000. The first two-cylinder machine set to work in this country was the 20,000-kW English Electric turbine installed at the Valley Road power station of the Bradford Corporation. This unit has been notably successful in maintaining the public supply under normal and abnormal conditions, and following a long series of orders for similar machines in sizes from 6,000 to 30,000 kW, a repeat order has now been received by the company from its first customer. The new turbine which has been put in hand to the specification of Mr. T. Roles, the chief engineer of the Bradford undertaking, will be a 30,000-kW machine and will embody the latest features of the English Electric multi-cylinder design. It will be generally similar to a unit of the same output now under construction for the West Ham Corporation. Another repeat order for a two-cylinder turbo-alternator set has been received from Messrs. Edward Lloyd, the large newsprint manufacturers. Like the first machine installed by Messrs. Edward Lloyd in their Kemsley power house, the new set will be of 12,500 kW and will run at 3,000 r.p.m. Within the past few months new units of this design have been started up at Peterborough and at Huddersfield, while a 25,000-kW unit is under construction for Leicester. Where the steam plant has to satisfy certain special conditions such as arise in industrial service, it is not always appropriate to sub-divide the steam end. An instance of this is provided by the two 10,000-kW sets recently ordered by the State Electricity Commission of Victoria for the Yallourn briquetting plant. The original plant was steam driven, but the new extensions are being designed for electrical driving of the presses, utilising exhaust steam from the turbines for drying out the brown coal before it is pressed; there will be a large surplus of electrical energy which will be fed into the public mains. It is anticipated that the output of briquettes will be quadrupled for an increase in capital expenditure of only some 16 per cent. The turbines, which will be of the company's impulse type, running at 3,000 r.p.m., will operate at a steam pressure of 565 lb. per sq. in., with a total temperature of 750 deg. F., and will supply steam for drying at a pressure of 55 lb. per sq. in. No fewer than 25 tenders were submitted for the plant, including seven from Continental manufacturers.

Messrs. Edward Bennis & Co., Ltd., have sent us a list of orders recently placed with them. Among these are contracts for mechanical chain grate stokers for the City of London Electric Lighting Co., Ltd., Sunderland Corporation Electricity Works, and the Wakefield Corporation Electricity Works. Orders for mechanical stoking equipment for Lancashire boilers have been received from a number of municipal and commercial undertakings, including the Sunderland and Hoylake electricity works and the Clyde Valley Electric Power Co.

The contract for the electrical installation at the reconstructed Empire Theatre, Edinburgh, has been carried out by Messrs. Malcolm & Allan, Ltd. The rubber insulated wiring used throughout in this contract was manufactured by Messrs. Johnson & Phillips, Ltd.; the main cables were supplied by the British Insulated Cables, Ltd.; the main switchboard, and all switch-, fuse-, and lighting control gear were supplied by Messrs. William White & Co., London; the electrical fittings throughout the theatre were supplied by Messrs. F. T. Cash, London; and the conduits were made by the Credenda Conduits Co., Ltd.

Among the orders recently received by the Equipment and Engineering Co., Ltd., are the following:—York Corporation: A 4-gun "Cyclone" 'bus and tram washing plant. The Hebble 'Bus Services: A 6-gun plant. Plymouth Corporation: One mile of Phono electric trolley wire. Leicester Corporation: Twelve complete sets of "Ackley" adjustable brake gear.

The Poso-Graph (Parent) Corporation has placed orders with Metro-Vick Supplies, Ltd., for a large quantity of electrical accessories and electric light fittings for continued use as standard equipment with the Poso-Graph (Parent) Corporation.

The Automatic Telephone Manufacturing Co., Ltd., announced last week that it had been awarded a contract by the G.P.O., to the value of £400,000, for a 10,000-line Strowger automatic exchange and associated manual exchange equipment for Manchester.

Government Aid for Industry.

The Times reports that Sir Henry Bunbury, Comptroller and Accountant-General of the G.P.O., read a paper on Saturday last at a conference of works directors, managers and foremen at Oxford. In this he suggested ways in which the Government could assist industry. He said that there was a great need of better and fuller statistics of production, capacity and unfilled orders than we had at present. The Census of Production was essentially a study. What was wanted, if it was to be of practical value to industrialists, was live and up-to-date information, which would help them in forecasting the future trend of business. Although it was conceivable that industries could organise this service for themselves without Government aid, there was little doubt that it would be organised more quickly and completely if industry had the backing of a Government Department, which would plan the main lines of the work and could have some power of coercing a recalcitrant minority. Here, a Government Department had the great advantage of being disinterested and impartial, and able to keep a secret, and in a matter of this sort these things counted for a great deal. This question, in fact, had a very definite bearing on the unemployment problem. Another form of help which might be extended was the encouragement of standardisation and pattern simplification. Here, because of vested interests or inertia, some form of pressure was necessary to get a move on.

The Marking of Imported Cables and Lamps.

Notice is given by the Board of Trade that the requirements as to the marking of imported goods will take effect as from October 13th in the case of insulated wires and cables, and as from January 13th, 1929, in the case of incandescent electric lamps.

German Cable Exports.

The exports of cables from Germany in 1913 amounted to 47,600 tons, of which Holland received 6,900 tons, Argentina 6,800 tons, Belgium 5,300 tons, and Norway, Japan and the Dutch East Indies about 3,500 tons each. The quantity sent to Holland in 1926 was 12,796 tons, 13,325 tons in 1927, and 5,261 tons in the first seven months of this year. The exports to Argentina were 5,403 tons, 5,944 tons and 5,382 tons in the same periods, respectively. The quantities sent to France were 40 tons, 840 tons and 1,718 tons; to Finland 1,063 tons, 1,524 tons, and 1,718 tons; and to England 1,141 tons, 1,306 tons, and 811 tons.

Prices of Materials.

The following prices are only general, and they may vary according to quantities and other circumstances:—

	CHEMICALS, &c.	Price Oct. 2nd.	Fortnight's inc. or dec.
a	Acid, Oxalic ... ... per lb.	5½d.	...
a	Ammoniac, Sal ... ... per ton.	£60	...
a	Ammonia, Muriate (large crystal) ,,	£52	...
a	Bisulphide of Carbon ... ... ,,	...	...
a	Borax ... ... ,,	£25	...
a	Copper Sulphate ... ... ,,	£25 10s.	...
a	Potash, Chlorate ... ... per lb.	3½d. to 4d.	...
a	,, Perchlorate ... ... ,,	5½d.	...
a	Shellac ... ... per cwt.	£18 10s.	...
a	Sulphur, Commercial ... ... ,,	£11	...
a	,, Roll ... ... ,,	£11	...
a	Soda, Chlorate ... ... per lb.	3d.	...
a	,, Crystals ... ... per ton.	£5 to £5 5s.	...
a	Sodium Bichromate, casks ... per lb.	3½d.	...
	METALS, &c.		
b	Aluminium, Ingots ... ... per ton.	£95 to £100	...
b	,, Wire ... ... per lb.	1/8 to 1/9	...
b	,, Sheet ... ... ,,	1/8 to 2/9	...
p	Babbitts Metal and Anti-friction Metal—		
	Grade I ... ... per ton net.	£206	£12 inc.
	Grade II ... ... ,, ,,	£144	£9 inc.
	Grade III ... ... ,, ,,	£77	£4 inc.
c	Brass (rolled metal 2" to 12" basis) per lb.	9¼d.	¼d. inc.
c	,, Tubes (solid drawn) ... ... ,,	1/- to 1/0½d.	½d. inc.
c	,, Wire, basis ... ... ,,	10½d.	½d. inc.
c	Copper Tubes (solid drawn) ... ,,	1/1½	½d. inc.
c	,, Bars (best selected) ... per ton.	£96	£2 inc.
c	,, Sheet ... ... ,,	£96	£2 inc.
c	,, Rod ... ... ,,	£96	£2 inc
d	,, (Electrolytic) Bars ... ,,	£70 15s.	...
d	,, ,, Sheets ... ,,	£143 10s.	...
d	,, ,, Wire Rods ,,	£80 15s.	...
d	,, ,, H.C. Wire per lb.	10½d.	...
f	Ebonite Rod ... ... ,,	2/8 to 2/6	...
f	,, Sheet ... ... ,,	2/8 to 2/6	...
n	German Silver Wire ... ... ,,	2/2	...
h	Gutta-percha, fine ... ... ,,	nom.	...
h	India-rubber, Para fine ... ... ,,	10½d.	...
l	Iron Pig (Cleveland No. 3.) ... per ton.	66/-	...
l	,, Wire, galv. No. 8, P.O. qual. ,,	£21	...
g	Lead, English pig ... ... ,,	£23 5s.	...
g	Mercury ... ... per bot.	£35 to £35 5s.	25/- inc.
e	Mica (in original cases) small ... per lb.	3d. to 3/-	...
e	,, ,, medium ,,	4/- to 8/-	...
e	,, ,, large ... ,,	10/- to 20/- & up	...
p	Phosphor Bronze, plane castings ,,	1/3½	...
p	,, ,, drawn bars & rods ,,	1/3	...
p	,, ,, rolled strip & sheet ,,	1/2½	...
p	,, ,, wire... ... ... ,,	1/4	¼d. inc.
o	Platinum ... ... per oz.	£17 15s.	...
d	Silicium Bronze Wire ... ... per lb.	10½d.	...
r	Steel, Magnet, in bars ... ... ,,	7½d.	...
n	Tin, Block (English) ... ... per ton.	£223 to £223 10s.	£3 17s. to £9 inc.
n	,, Wire, Nos. 1 to 16 ... ... per lb.	3/8	...

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

Reporting on the lead market, under date September 29th, Messrs. James Forster & Co. stated:—"Conditions have not altered since last week. Demand in this country is, on the whole, quiet, cable makers particularly showing little interest, while on the Continent there is as yet no sign of another wave of buying. Arrivals continue short, and more lead is being taken from warehouses for consumers' requirements, which means that the position is steadily improving. We do not expect to see lead fall very much further, but at the moment there is nothing in sight to justify higher prices."

Lighting and Power Notes.

Accrington.—Year's Working.—The accounts of the Corporation electricity undertaking (engineer: Mr. A. W. Clegg) for the year ended March 31st last record a total income of £84,626, as compared with £93,167 in the preceding year, and working expenses of £41,312, as against £57,887, leaving a gross profit of £43,314 (£35,280). After payment of capital charges there was a net surplus of £9,651, as compared with £4,668 in 1926-27. The sales of electricity increased from 15,022,259 to 17,803,433 kWh, and the maximum supply demanded from 8,900 to 9,600 kW. The average price obtained per kWh fell from 1.484d. to 1.135d.

Beckenham.—Electricity in Bulk.—The Urban District Council Electricity Committee has given instructions for negotiations to be opened with the West Kent Electric Co., Ltd., for a partial bulk supply, and has instructed the engineer to prepare estimates and invite tenders for the apparatus required in connection with this supply.

Mains Extensions.—The Committee has authorised mains extensions at a cost of £2,120.

Belgian Congo.—Progress of Supply.—The report for the last financial year of the Societe Coloniale d'Electricité, of Brussels, which is interested in electricity supply in the Belgian Congo, states that the central station at Elisabethville is now in full working order and the demand, especially for power supply, is showing a steady growth. At the central station at Leopoldville, some difficulties have been experienced owing to an outbreak of yellow fever, but the plant is now in normal operation. In order to meet the growing demand in the eastern part of the town a second generating plant with two 600-h.p. Diesel engines is being established. The company has also recently applied for a concession for the supply of electrical energy in the towns of Boma and Matadi.

Bishop's Castle.—Street Lighting.—The Town Council has accepted the tender of the local electricity supply company for public lighting for the ensuing season at £97 10s. for 34 60-c.p. lamps, including five all-night lamps.

Bradford.—Street Lighting.—A sub-committee of the Corporation, having considered reports from the city electrical engineer and the city gas engineer, with regard to street lighting in districts in the city within the supply areas of the Pudsey Gas Co. and the Drighlington and Gildersome Gas Light Co., and also an appeal from the Chief Constable for better lighting in Cutler Heights Lane and Dick Lane, has authorised steps to be taken for the electric lighting of the two roads named, at an estimated cost of £586. The Committee has also asked the city electrical engineer (Mr. T. Roles) to prepare an estimate of the cost of substituting electricity for gas lighting in all other Bradford streets within gas company areas.

Brighton.—Loans Sanctioned.—The Corporation Electricity Committee has obtained sanction to borrow £8.000 for buildings and £2,700 for plant at Southwick power station.

Electricity in Bulk.—The General Purposes Committee has received a report from the borough electrical engineer on the request of the Central Electricity Board asking the Corporation to provide a temporary bulk supply of electricity to Worthing. He recommends the offer of a supply at 8,000 V, 3-phase, 50 cycles, on the following terms: £2 10s. per annum per kW of maximum demand, plus a "unit" charge of, say, 0.35d. Worthing is to take as a base load a demand of at least 700 kW at an estimated load factor of 55 per cent. The terms will stand until such time as the Southern section of the national scheme has been fully developed, and the necessary overhead e.h.p. interconnecting lines are completed. By this arrangement the Corporation will receive a minimum of £1,750, as a contribution towards its interest and sinking fund charges in respect of capital expenditure, to which it is already committed. The Committee has recommended that the report be approved.

Street Lighting.—The Lighting Committee has voted £5,000 for lighting improvements in London Road and Dyke Road.

Burnley.—Loan.—To cover anticipated expenditure on mains, the Corporation proposes to apply for sanction to a loan of £40,000.

Cardiff.—Year's Working.—We have received from Mr. C. G. Morley New, city electrical engineer, a copy of his report, together with the statement of accounts on the working of the electricity undertaking during the year ended March 31st last. Despite reductions made during the year in the electricity charges, the revenue increased from £256,349 to £264,776, and as working expenses decreased from £124,578 to £99,316, there was an increased gross profit of £165,460, as compared with £131,771 in the preceding year. After providing for capital charges, a net surplus of £68,284 remained, as against £40,390. The capital expenditure during the year amounted to £96 341, and included £32 665 for machinery and £56,643 for mains and services. The electrical energy sold increased from 33,519,693 to 38,339,859 kWh, and the maximum supply demanded from 15,803 to 17,303 kW. The average price obtained per kWh fell from 1.83d. to 1.66d. The length of cables laid during the year was 46 miles, bringing the total to 431. The reductions in tariffs during the year brought the charges down to pre-war level, and in many instances below pre-war level. Further reduced charges have been brought into operation as from the September quarter readings.

Chester.—Electrical Development.—The City Electricity Committee is developing its policy of giving a plentiful supply of electricity in the country districts surrounding Chester, and is encouraging the use of electro-farming appliances. It is now intended to spend a further £20,000 to meet the cost of extensions, and to appoint an assistant to Mr. S. E. Britton, the city electrical engineer.

Continental.—Corsica.—The principle of granting subsidies to the intercommunal groups which have been formed to provide the island with an electricity supply system has recently been approved by the General Council of Corsica. Pending the construction of hydro-electric plants, a number of steam-operated generating stations are to be established as quickly as possible, together with a main distribution system, the cost of which is estimated at about £320,000. When the hydro-electric plants are completed, the steam stations will be maintained as stand-bys for use in periods of dry weather.

Germany.—Despite the recent completion of the Klingenberg power station, the demand for electricity in Berlin is growing so rapidly that plans are being prepared for the erection of a new generating plant at Siemenstadt, Berlin, at an estimated cost of approximately £4,500,000.

Coventry.—Loan.—The City Council is to apply for sanction to a loan of £40,000 for future extensions of mains in order to provide for the requirements of the enlarged area of the city.

Dover.—Alteration of Pressure.—The Corporation Electricity Committee has recommended that application be made for sanction to the alteration of the pressure from 100 to 200 V in the rest of its area of electricity supply.

East Ham.—New Cables.—The Borough Council Electricity Committee is to lay cables at a cost of £2,265.

Hornsey.—Mains Extensions.—The Corporation Electricity Committee has authorised mains extensions at an estimated cost of £1,000.

Ilford.—Loans.—The Corporation Electricity Committee has applied for sanction to borrow £17,095 in respect of main generating and sub-station plant, and £50,000 for mains and services.

Isle of Wight.—Electricity Supply.—The County Highways Committee reports that it has received plans of the proposals of the Isle of Wight Electric Light & Power Co., Ltd., for the erection of overhead cables in the villages of Wootton, Brading, Fishbourne, Gurnand, Wroxall, Niton, Bembridge St. Helens and Carisbrooke. The Committee has informed the company that it has no objection to the proposals.

Leicester.—Loan.—The Corporation Electricity Committee is to apply for sanction to a loan of £40,000 for mains extensions.

London.—Battersea.—The borough electrical engineer has prepared a report showing the estimated cost of laying mains for private services in all streets or parts of streets in which they are not at present laid, laying public lighting mains and converting gas lamps in such streets, and providing services for consumers likely to be obtained during the first year if such mains are laid. The estimate is £56,000 for laying mains for private consumers, £16,000 for laying mains for public lighting and converting gas lamps (£653), and £11,000 for providing services. The Committee has selected certain streets for the immediate development of the distribution side of the undertaking, at a cost of £24,500. Application is to be made for sanction to a loan for this purpose.

The Electricity Committee has considered the introduction of a two-part tariff for domestic supplies as an alternative to the present flat rate charges of 4d. per kWh for lighting and 1d. per kWh for heating and cooking in order to encourage the use of electricity for all purposes, and has recommended that such a tariff be adopted for premises separately rated, the fixed charge per annum to be 12½ per cent. of the ratable value and the "unit" charge ¾d.

The Electricity Commissioners have notified the Electricity Committee that they have decided to consent to the extension of the generating station by the installation of one 30,000-kW set and boiler plant. The Borough Council has already invited tenders for the plant.

Hammersmith.—The Electricity Committee has recommended that an additional sum of £6,000 be provided from the accumulated surplus revenue in connection with the scheme for the hire and hire-purchase of electric wiring installations.

Poplar.—The Borough Council Electricity Committee has decided to extend mains at a cost of £1,530 to meet applications from the Millwall area.

Lynton.—Special Order.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation a Special Order made by them authorising the Lynton and Lynmouth Electric Light Co., Ltd., to supply electricity in the urban district of Lynton and part of the rural district of Barnstaple.

Lytham-St. Annes.—Loans.—The Town Council has applied for sanction to loans of £35,000 for mains, services, and meters, and £11,000 for mains, services and a transformer kiosk, in connection with the supply to outlying districts.

Northern Ireland.—Bangor.—The Urban District Council has decided to take a bulk supply of electricity from Belfast instead of erecting a local generating station. Terms of the proposed agreement were finally approved at a recent Council meeting.

Preesall.—Increased Charges.—The Urban District Council has decided to increase the charges for electricity from 8d. to 10d. per kWh for lighting, from 2d. to 4d. per kWh to small power consumers, from 10d. to 1s. per kWh for prepayment meters, and from 8d. to 10d. per kWh for public lighting.

Preston.—Year's Working.—The report on the working of the Corporation electricity undertaking (engineer, Mr. J. F. Simpson) for the year ended March 31st last shows a total revenue of £207,586, as compared with £171,868 in the preceding year. Working expenses amounted to £100,499, as against £100,298, leaving a gross profit of £107,087 (£71,570). Interest and loan charges absorbed £98,157, and capital expenditure defrayed out of revenue, £3,047, and there was a net surplus of £17,565, as compared with a deficit of £1,221 in 1926-27. The capital expenditure during the year amounted to £206,854, the chief items being £57,565 for plant and machinery, £47,439 for transmission lines, and £52,901 for mains and services. There was a considerable advance in the sales of electrical energy, from 26,969,060 to 38,276,214 kWh, an increase of 42 per cent., and the number of consumers was 9,486, an increase of 26 per cent. The maximum supply demanded rose from 12,000 to 17,000 kW. A third turbo-alternator was put into commission during the year, and orders were placed for a fourth set, together with boilers, which it is hoped will be completed in time for the winter load. Approximately 24 miles of mains were laid.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

Beckenham.—Lighting: Flat rate from 6d. to 5d. per kWh.

Warrington.—Lighting: First 1,000 kWh per quarter, 4½d. per kWh; all energy in excess, 4d. per kWh. Small power rate: First 1,000 kWh per quarter, 2½d. per kWh; all energy in excess, 1½d. per kWh. Reductions have also been made in the kVA power scale. A discount of 5 per cent. for prompt payment of accounts.

Ilford.—Lighting: Flat rate, 4d. per kWh; maximum demand rate, for the equivalent of one hour's use of maximum demand per day, 6d. per kWh, and for all energy in excess, 1d. per kWh. Power: Varying from 2d. per kWh for the first 1,500 kWh per quarter to 1.2d. for over 100,000 kWh. Heating and cooking: Flat rate of 1d. per kWh.

Saxmundham.—Inauguration of Supply.—An electricity supply for the district was formally inaugurated by the chairman of the Urban District Council on September 24th. The supply is in the hands of the East Suffolk Electricity Distribution Co., Ltd., and is obtained from Ipswich.

South Africa.—Durban.—The *South African Engineer* reports that another record has been established by the Alice Street power station for the municipal year ended July 31st, 1928, the last year in which it will be in full operation. The electrical energy delivered to mains totalled 78,490,625 kWh, as against 68,005,094 kWh during the previous year, an increase of 15.4 per cent. The average cost per kWh was 0.297d. last year's figure being 0.311d. The total sales amounted to 69,858,629 kWh. Domestic appliances installed during the year included 1,404 electric stoves, 791 water heaters, and 151 refrigerators. The total number of consumers increased to 19,642, and the number of street lamps 7,002.

Stranraer.—Electricity Supply.—At a recent meeting of the Town Council a report was submitted regarding the negotiations with the Ayrshire Electricity Board for providing a supply of electricity to the burgh. It was stated that as the cost of bringing the supply overland from Girvan, a distance of 30 miles, was prohibitive, the Board was prepared, in the event of adequate local support being forthcoming, to apply for the necessary Order to erect a generating station in Stranraer. A draft agreement, under which the Council granted to the Board the option for one year of applying for statutory powers to supply electricity within the burgh, had been revised, and was approved by the Council.

Swansea.—Unemployment Relief Schemes.—In order to provide work for the unemployed, the Corporation has resolved to put in hand before the specified time the laying of an e.h.p. main to a sub-station to be erected, together with the necessary l.p. distributors, at an estimated cost of £11,998, and another similar main from a sub-station to a proposed kiosk, at an estimated cost of £12,610. Three other smaller e.h.p. mains are to be laid, at an aggregate cost of £6,700.

Electricity in Bulk.—The Corporation has decided to give a bulk supply of electricity to the Brynamman and District Electric Supply Co., Ltd., at an estimated cost of £4,580, and to make application for sanction to borrow the necessary money.

Thakeham.—Electricity Supply.—The Rural District Council has decided to oppose an electricity scheme submitted by the Steyning Electric Light Co., Ltd. The Power Development Co., Ltd., has also submitted a scheme, which is to be considered by a committee.

Uruguay.—Hydro-Electric Development.—The Government has approved a report made by the Special Commission appointed a year ago to study the hydro-electric development of the Rio Negro. The hydro-electric plans call for the erection of a dam across the Negro at its broadest point, which is in Western Uruguay; from that point power will be transmitted to Montevideo, a distance of 150 miles, and the surrounding well-developed district. The Government will send the plans to the Chamber of Deputies for consideration and adoption. Following acceptance by both Houses of the Legislature, the Ministry of Public Works will ask leading construction companies in various countries to send representatives to Uruguay to study the proposal and to advise the Government as to the best site for the plant. Later, bids will be invited for the construction of the dam and power plant, preference being given to contractors who agree to arrange the financing.—*Reuter's Trade Service* (Montevideo).

Warrington.—Year's Working.—The report of the borough electrical engineer (Mr. F. V. L. Mathias) on the working of the electricity undertaking for the year ended March 31st last shows a total income of £133,771, and working expenditure of £79,488, leaving a gross profit of £54,283. The figures for the preceding year were: Income, £128,650; working expenses, £83,511; gross profit, £45,139. To the gross profit was added interest on investments and bank interest, making a total of £55,485. After providing for capital and other charges there was a net surplus of £18,964, as compared with £7,293 in the preceding year. The capital expenditure during the year amounted to £24,772, the bulk of which was expended on mains and services. The electrical energy sold increased from 18,519,820 to 20,327,260 kWh, and the maximum supply demanded from 8,290 to 9,600 kW.

Tramway and Railway Notes.

Brighton.—Tramcars *v.* 'Buses.—The General Purposes Committee has considered a report from the Tramways Committee regarding the renewal of the tramway track round the Victoria Gardens. The tramway engineer reported that the congestion caused by motor traffic in the Grand Parade could be relieved round the Gardens, and expensive widening definitely postponed if the rails were laid inside the Gardens on wooden sleepers. The cost of the renewals would be about £17,500, and the cost of abandoning the existing tramway, taking up the rails and paving and laying new rails in the Gardens would be £18,000, excluding alterations to the Garden beds. The gain to the community generally by the alterations would be worth the additional sum. The General Purposes Committee disagrees with this proposal, and has instructed the special sub-committee to consider the whole question of motor transport in the borough.

Track Renewal.—The Corporation Tramways Committee has decided to relay the tramway track in North Road.

Continental.—Italy.—Negotiations are in progress between the Swiss Federal and Italian State railway authorities regarding a proposal to replace the three-phase cables running through the Simplon tunnel by single-phase conductors.

Glasgow.—Pinkston Station.—The Electricity Commissioners have forwarded to the Town Clerk of Glasgow their reply to the request of the Corporation Tramways Department for their permission to proceed with a scheme for the reconditioning and extension of Pinkston power station at an estimated cost of £237,000. The nature of the Commissioners' reply has not been made public, but it is stated that further negotiations will be necessary before a definite conclusion is reached.

Ilford.—Year's Working.—The report on the working of the Corporation tramway undertaking (manager: Mr. L. E. Harvey) for the year ended March 31st last shows a total income of £77,595, as compared with £72,208 in the preceding year. Working expenses amounted to £57,880, as against £57,190, leaving a gross profit of £19,715 (£15,017), and after payment of capital charges there was a net surplus of £8,674, as compared with £4,921 in 1926-27. The number of passengers carried increased from 14,647,033 to 15,829,480, and the car miles run from 999,650 to 1,076,378.

Swansea.—New Tramway Feeder.—The existing tramway feeder from Swansea to Morriston, a distance of about three miles, needs renewal, and the Corporation has decided to carry out the work at an estimated cost of £5,000, the Corporation to be repaid the sum by the Swansea Improvements & Tramways Co., which is responsible for the renewal and maintenance.

Telegraph and Telephone Notes.

Argentina.—Telephone Tariff.—A Government decree made a reduction of the telephone tariff effective on October 1st.

India.—Indo-Ceylon Telegraphy.—In view of the complaints of business communities in Ceylon and India that they are being subjected to serious inconvenience on account of delay and mutilation caused by what is called an obsolete system of working, the Government is carrying out experiments between Madras and Colombo to provide for simultaneous communication between Colombo and Madras and Colombo and Madura. This would double the carrying capacity of one cable and would greatly accelerate disposal of traffic for stations south of Madura which hitherto has had to travel *via* Madras.

Irish Free State.—Telegrams.—On October 1st, the charge for a telegram sent from Great Britain or Northern Ireland to a place within the Irish Free State became 1s. 6d. for twelve words, or less, and 1d. for every word over twelve.

Isle of Man.—New Submarine Cable.—The Post Office is to link the Isle of Man and the mainland by a telephone cable and to extend the usual facilities to the island. A type of submarine cable has been designed to meet the special conditions, says *The Times*. While the cable is being manufactured by Messrs. Siemens Bros. & Co., Ltd., of Woolwich, the laying of the connecting land cables is to proceed on the island and the mainland. H.M. Office of Works has completed the purchase of what was formerly a school in Port Erin on which it intends erecting a repeater telephone station. The Post Office engineering department in London has also asked for tenders for the laying of an underground cable between this repeating station and Douglas, where the island's central station will be situated. It is hoped to get this cable and the sea cable laid in time for next season. The proposed cable, between 30 and 40 miles, will probably start from Cornah, I.O.M., and terminate at Whitehaven in Cumberland. The cost of laying the sea cable alone will be £80,000. The need of a telephone service is recognised as urgent, because the postal telegraph service closes in Douglas at 8 p.m. even during the summer, and in other towns of the island at 7 p.m.

In addition to the telephone line connecting England and the Isle of Man, it has been decided to open a service between the isle and Ireland. It is expected that more satisfactory transmission between Northern Ireland and England will also be obtainable by means of the new cables. The Ulster end of the cable will be at Ballyhornan, near the mouth of Strangford Lough, where a repeater station is to be constructed. From Ballyhornan the line will be underground to Belfast, *via* Downpatrick.

Pacific Cable.—Income.—The report of the Pacific Cable Board for the year ended March 31st, 1928, states that traffic receipts (£387,046) showed a decrease of £80,017, due entirely to the entry into the telegraph field of the "beam" wireless service between Britain and Australia, which started in April, 1927, at lower rates than those of the cables. The loss was principally in the cheap classes of traffic, says the *Financial News*, which was limited to plain language and subject to delay. The ordinary rate traffic was not seriously affected by the new competition.

South Africa.—Cape Peninsula Telephones.—At the end of June of this year the number of extensions from the Post Office exchange amounted to 15,499, an increase of 5,106, or 50 per cent., since 1923. Although it shows an average increase of 10 per cent., the increase has actually taken place progressively from year to year. The increase is made up of 2,009 residential subscribers, 1,266 business extensions, 300 lines to private branch exchanges, 1,160 extensions off private branch exchanges, and 371 other lines. A new manual exchange is being installed at Sea Point.

Automatic Telephony.—Bearing in mind the prohibition by the Minister of Posts and Telegraphs of the interconnection of any automatic telephone system in future with that of the Post Office Department, it is noted with interest by the *South African Engineer* that the South African Railways Administration has called for tenders for an automatic telephone system for installation in the Cape Town railway station, with an immediate capacity of 350 lines, an ultimate capacity of 600, and capable of future extension to 1,000 lines. Most of the offices in which automatic telephones will be installed are served at present by a manual branch exchange connected to the Post Office system, which, it is announced, will be retained, though doubtless the fact that the equipment will be provided with apparatus for junction working to two public exchanges indicates that the Administration anticipates the raising of the present ban at no distant date.

United States.—Radio-telegraphy.—By filing at Washington on September 26th, before the Federal Radio Commission its application for the allocation of 67 wave-lengths over which to transmit domestic wireless messages, the Radio Corporation has taken the first step in what may become a struggle between it and the older established land-wire companies, such as the Western Union and the Mackay Companies. Ever since trans-oceanic wireless was placed in operation, the Radio Corporation, through lack of other facilities, has had to depend on other domestic telegraph companies with which it is in cable competition to carry to points within the United States the messages it receives daily from abroad. The Radio Corporation claims, however, that this method of distribution has never been satisfactory, and it is now seeking permission to establish its own network of domestic stations (in all about thirty, situated in the leading commercial centres of the country) so that it can distribute its own messages without employing others. Very likely the companies at present engaged in the domestic telegraph business will seek to oppose the Radio Corporation's application, and the development of a struggle is being watched with the keenest interest by the financial interests involved.—*Reuter* (New York).

The International Telephone and Telegraph Company, through its subsidiary, the Mackay Radio Company, has applied to the Federal Government for a number of short-wave channels, to make possible the establishment of a commercial wireless service throughout the country. Several other organisations have also applied for major allocations of short-wave lengths, chief among them being the Radio Corporation, which is seeking to supplement its international connections.—*Reuter* (Washington).

West Indies.—Telegraph System.—The report of the Pacific Cable Board for the year ended March 31st, 1928, on the working of the submarine cable system and wireless-telegraph stations of the West Indian Islands and British Guiana shows that the traffic receipts (£52,568) exceeded those of the previous year by £2,654. The number of words handled totalled 1,388,637 (including 66,555 words in telegrams exchanged with ships at sea), compared with 1,379,769 words (including 57,310 words in ships' telegrams) during the preceding year. The receipts during the first half of the year under review were substantially in advance of those for the corresponding period of the previous year; during the latter part of the year, however, new wireless competition developed for foreign traffic, which resulted in a substantial decline in the Board's business between the United States and Venezuela and between Dutch Guiana and Holland. In consequence, the international traffic (1,057,948) words handled in 1927-28 fell short by 34,380 words of that handled during the previous year. There was gratifying progress in the inter-colonial business (*viz.*, messages exchanged within the West Indies and British Guiana), the number of words handled being 241,247, an increase of 36,351 words, compared with the previous year. The net expenditure (£33,270) was £310 less than that of the preceding year, due to the withdrawal from the West Indies of staff loaned by the Pacific system in connection with the organising of the service. The surplus of receipts over net expenditure amounted to £20,013, compared with £16,831; the payment of £6,000 to the reserve and renewal fund reduced that surplus to £14,013, and this sum was available towards meeting the annuity of £26,083 payable to the National Debt Commissioners in respect of interest on and repayment of the advances, by way of capital for laying the cables, installing the wireless stations, and equipping the system. The deficiency to be made good by the contributing Governments in respect of the year under review is therefore £12,070. During the year under review no interruptions occurred to the cables and none of the wireless stations was out of commission on any occasion.

Radio Notes.

Austria.—Linz Station.—The Linz station, situate about 125 miles from Vienna, is of English manufacture and the first of its type to be erected in Austria. We learn from Marconi's Wireless Telegraph Co., Ltd., that the transmitter has a power of 1.5 kW and operates on a wave-length of 254.2 metres, the constancy of which is maintained by crystal control. The masts are 150 ft. high and 400 ft. apart. The plant has been built specially for the benefit of listeners in Upper Austria who are unable to hear the Vienna station with simple sets.

B.B.C.—New Premises.—The British Broadcasting Corporation intends to build new premises to replace its present headquarters at Savoy Hill. To this end negotiations are in progress, says the *Evening News*, regarding the construction of a building on a site at the corner of Portland Place and Langham Street, Oxford Circus. The first twin-wave regional station that is being built at Brookmans Park will eventually replace the London transmitter (2LO), which is situated on the roof of stores in Oxford Street.

Canada.—Wavelength Conference.—An important conference on the allocation of wave-lengths will be held in Ottawa about the middle of November, at which will attend representatives of the Governments of the United States, Mexico, Cuba and Canada. Commander C. P. Edwards, Director of the Radio Branch of the Department of Marine, attended a conference in Washington, where various angles of the problem were dealt with. Further investigation was agreed upon, with a view to final reports being submitted at the meeting to be held in Ottawa ninety days after the Washington adjournment, says *World-Radio*.

Canada, according to one of the Government Radio Inspectors, is unaffected by the U.S.A. Federal Radio Commission's new allotment of wave-lengths throughout the five zones that will divide the United States equally and reduce the number of full-time broadcasting assignments from 545 to 310. The only change so far as the Dominion is concerned is that there will be one less shared wave-length, only eleven, whereas formerly there were twelve.

Italy.—Milan Station.—The Milan station, which is owned by the Unione Radiofonica Italiana, the sole broadcasting concessionnaire in the country, is about 2.5 miles from the city on a site one mile square. The Marconi plant feeds 7 kW to the twin-wire T-shaped aerial, which is supported by two masts 265 ft. high.

Switzerland.—Receiving Licences.—The Department of Overseas Trade is informed that the Federal Administration of Telegraphs is issuing as from September 1st monthly licences for wireless receivers. The formalities for their issue have been made very simple, as the object of the new system is to enable owners of new receiving sets to test their sets thoroughly before applying for the ordinary annual licence, the cost of which was raised from 12 to 15 francs on January 1st, 1928.

United States.—Stations on Probation.—In consequence of their alleged broadcasting of "personal disputes," four Pennsylvanian stations have been placed on probation for 30 days, says *World-Radio*, pending a decision whether they shall be re-licensed or not.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the Electrical Review containing the advertisement is given in parentheses below.

Contracts Open.

Australia.—Melbourne.—Posts and Telegraphs Department. November 13th. Switchboard keys and parts. (B.X. 4752.)*
November 27th. Condensers. (B.X. 4753.)* Indicators. (B.X. 4751.)*
November 29th. Telephone apparatus. (B.X. 4757.)*
November 20th. Relays. (B.X. 4729).*
November 14th. Totally enclosed metal-clad type switchgear and spares. (B.X. 4748).*
Victorian Electricity Commission.—December 17th. Supply of metal-clad switchgear and accessories. (Spec. 28/68, £1 1s. for three copies.)

Canada.—The Department of Overseas Trade reports that a Canadian company is requiring three or four 3,000-kW, 450-600-V synchronous motor driven generator sets for electrolytic zinc work. (B.X. 4769.)*

Chile.—Santiago.—October 17th. Chilean State Railways. Annual requirements of electrical materials. (C. 2885.)*

Darlington.—October 15th. Electricity Department. Cooling tower.

Eccles.—October 8th. Health Committee. Electric light wiring and fittings for 66 houses in Edison Road, Patricroft. Specifications (£1 1s.) from Borough Electrical Engineer, Electricity Works, Cawdor Street, Patricroft.

Edinburgh.—October 15th. Corporation. Coal and ash plant for Portobello power station. (September 7th.)

Egypt.—November 10th. Ministry of the Interior. Supply and installation of a distribution network for the village of Kena. (B.X. 4707.)*

Erith.—October 15th. Electricity Department. H. and l.p. cable. (See this issue.)

Hawarden.—October 10th. Rural District Council. Wiring for electric lighting the isolation hospital, Pentrobin, Buckley. Mr. A. K. Wroe, clerk, Carlton House.

India.—October 16th. India Store Department. Oil-engine-driven alternator sets and switchgear for Ahmednagar. (B.X. 4714.)*
October 11th. One push-button control passenger lift. (A.X. 6845.)*
October 11th. Two 150-kVA transformers. (September 21st.)
November 2nd. Three 75-kW oil engine alternator sets, water-cooling plant, tanks, switchboard cables, &c. (September 21st.)
October 17th. One water turbine and two oil-driven d.c. generating sets for the Mardan power station. (A.X. 4733.)*
October 12th. South Indian Railway Co., Ltd. Electric cables and wires. (See this issue.)

Irish Free State.—Dublin.—November 5th. Electricity Supply Board. Two 5,000-kVA transformers and switchgear. (See this issue.)
Waterford.—October 19th. Harbour Commissioners. 20-ton electrically-operated hoisting and slewing travelling crane. Specifications (2ls.) from the Harbour engineer.

Isleworth.—Board of Guardians. Installation of an intercommunication telephone at the Institution. September 28th.

Leicester.—October 8th. Sewage Works and Farms Committee. Electric lighting installation for the Abbey Pumping Station. (September 28th.)

London.—Southwark.—October 23rd. Electricity Department. Electric cable for 12 months. (September 14th.)
Islington.—October 8th. Cleansing Committee. Two new lead batteries for refuse collecting vehicles. (September 21st.)
Paddington.—October 9th. Great Western Railway. Stores, including telegraph instruments, electrical apparatus and electric lamps. (September 21st.)
London County Council.—November 12th. Four electrically-driven centrifugal sewage pumping sets with switchgear, transformers, cables, &c. (See this issue.)

New Zealand.—Wellington.—November 27th. Public Works Department. Generators and water turbines, in connection with Section 1 of the Waitaki power scheme. (B.X. 4677.)*
Post and Telegraph Department. October 16th. Flameproof jumper wire. (B.X. 4770.)*

Norwich.—October 8th. Electricity Department. 12,500-kW turbo-generator and condensing plant. (September 14th.)

Rochdale.—November 13th. Electricity Department. A.c. single-phase prepayment meters for 12 months. (See this issue.)

Sidmouth.—October 11th. Urban District Council. L.p. overhead mains from the works to Sidford, about one and a half miles. Details from the engineer and manager, Mr. Henry Burgess.

South Africa.—Johannesburg.—November 9th. Posts and Telegraphs Department. Wall telephones for the Hillbrow exchange. (B.X. 4709.)*
November 15th. Dry cells and voltoids. (B.X. 4729.)*
November 8th. South African Railways and Harbours. Electrically-driven overhead travelling cranes for Pretoria and Pietermaritzburg workshops. (A.X. 6815.)*
Port Elizabeth.—October 11th. City Council. Electricity meters, demand indicators, and time switches. (B.X. 4756.)* Cables and wires. (B.X. 4755.)*
November 8th. 22,000-V armoured type switchgear. (B.X. 4763.)*
October 25th. Transformers. (B.X. 4760.)*
Durban.—October 26th. Corporation. Ten single-phase and two three-phase transformers for Alice Street power station. (B.X. 476I-2.)*

Wakefield.—October 18th. West Riding Education Committee. Installation of electric light at the Thorne Grammar School. Particulars from the Education Committee, County Hall, Wakefield.

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed.

Australia.—Sydney.—According to *Reuter*, the Cabinet of New South Wales has approved the acceptance of the tender of Messrs. Babcock & Wilcox for six boilers for the Ultimo power-house at a cost of £269,000, reported in our issues of September 21st and 28th. The New South Wales Executive Council recently did not approve the tender and referred it back to the Railway Commissioners.
Sydney.—City Council. Accepted:—
H. and l.p. submarine cables (£2,228), 102,500 yd. 33,000-V cable and 101,000 yd. of pilot cable (£149,332).—British General Electric Co., Ltd. —*Tenders.*

Barnstaple.—Town Council. Accepted:—
300-kW Diesel generating set (£5,926).—Mirrlees, Bickerton & Day, Ltd.

Birmingham.—Education Committee. Accepted:—
Electric lighting installation at Yardley Wood school (£280).—Ellis & Ward.
Installation of electric bells and telephones at Saltley secondary school (£92).—Reynolds & Bradwell.
Electric lighting installation at George Dixon school (£1,097); and at Moseley Road (deaf) school (£189).—Thomas Glover.

Brentwood.—Essex County Council. Accepted:—
Cables, distribution and lighting work in connection with the first portion of scheme for electricity installation at Brentwood Mental Hospital (£6,911).—Macintosh Cable Co., Ltd.

Carlisle.—School Management Committee. Accepted:—
Installing electric light at Caldewgate Schools.—R. M. Hill and Sons.

Dewsbury.—Board of Guardians. Accepted:—
Electric lamps.—George Crowther.

Egypt.—The Automatic Telephone Manufacturing Co., Ltd., has been awarded the contract for the erection of an automatic telephone exchange at Mansura. This company submitted the lowest tender, *viz.*, £E.12,632. The contract for the main equipment for an automatic exchange at Cairo has been awarded to Standard Telephones & Cables, Ltd., who quoted the lowest price of £E.42,824, and the contract for subscribers' instruments to the value of about £E16,000 for the same exchange has been awarded to the Automatic Telephone Manufacturing Co., Ltd.—*Reuter's Trade Service* (Cairo).

Grimsby.—Electricity Committee. Recommended:—
500-kW motor convertor (£2,619).—Crompton Parkinson, Ltd.
Increasing capacity of storage battery (£1,114).—Tudor Accumulator Co., Ltd.

Heston-Isleworth.—Electricity Committee. Accepted:—
Supply of cables (£12,290).—Enfield Cable Works, Ltd.
14-way unit-type feeder pillar (£149).—W. T. Henley's Telegraph Works Co., Ltd.

Ilford.—Electricity Committee. Accepted:—
Two transformer kiosks (£840).—Crompton Parkinson, Ltd.
Tramways Committee. Accepted:—
Copper trolley wire (10 1/16d. per lb.).—Rd. Johnson and Nephew, Ltd.
245 tons tram rails (£2,637) and 280 pairs fishplates (about seven tons) (£102).—Bolckow, Vaughan & Co., Ltd.
One pair track points and two crossings (£149).—Hadfields, Ltd.

Llandudno.—Electricity Committee. Recommended:—
Cables, transformer kiosks, and feeder pillars for the new extensions (£9,852).—W. T. Henley's Telegraph Works Co., Ltd.
Motor convertor (£2,190).—Bruce Peebles, Ltd.

London.—Westminster.—Board of Guardians.
Electric lamps for 12 months.—Metro-Vick. Supplies, Ltd.
Poplar.—Electricity Committee. Recommended:—
One pump motor and starter (£173).—Mirrlees, Watson, Ltd.
Extension of l.p. switchgear and distribution boards (£589).—George Ellison, Ltd.
Two distribution boards (£117).—Parmiter, Hope and Sugden, Ltd.
One 1,000-kW motor convertor (£3,348).—Bruce Peebles and Co., Edinburgh.
Switchgear.—(£279). New Switchgear Construction Co., Ltd.; (£193), Johnson & Phillips, Ltd.
Islington.—Board of Guardians.
Electrical accessories for six months.—Metro-Vick Supplies, Ltd.

Maidstone.—All Saints' Parochial Church Council. Accepted:—
Installing electric flood lighting in the church.—G. E. Wallis & Sons.

Stirling.—Town Council. Accepted:—
Installing etlectric light at 36 houses at Raploch.—P. H. Cossar.

Stoke-on-Trent.—Electricity Committee. Accepted:—
Two 60,000-lb. per hour water-tube boilers (£44,976).—John Thompson Water-tube Boilers, Ltd.
Secondary battery (£1,621).—Chloride Electrical Storage Co., Ltd.
Supply and erection of overhead services at Sutton Housing Estate, Trent Vale (£240).—Barnett & Soans.

Wimbledon.—Electricity Committee. Recommended:—
Two 400-kVA transformers in connection with supply to Splintex Safety Glass Co., Ltd. (£367).—C. A. Parsons and Co., Ltd.

Forthcoming Events.

British Electrical Development Association.—Factory and Workshop Lighting Campaign, Sales Conference and Demonstration. Friday, October 5th. Lighting Service Bureau, 15, Savoy Street, W.C. 7.30 p.m.

Junior Institution of Engineers.—Friday, October 5th. 39, Victoria Street, S.W. 7.30 p.m. Lecture, "Interesting Details of Swiss Alpine Railways." Mr. A. J. Simpson.
Friday, October 12th. 7.30 p.m. "The Use of Instruments at the Boiler-House." Mr. F. Squirrell.

Electrical Power Engineers' Association. — Saturday, October 6th. Hotel Cecil, Strand, W.C. 5.30 p.m. for 6 p.m. Annual dinner.
Tuesday, October 9th. Junior Institution of Engineers, 39, Victoria Street, S.W. 7.15 p.m. "Railway Electrification." Mr. T. Stevens.
Thursday, October 11th. Geographical Hall, Manchester. 7.45 p.m. "Modern Metering Practice." Mr. E. Fawssett.

Salford Technical and Engineering Association.—Saturday, October 6th. Royal Technical College. 7 p.m. "Electric Welding." Mr. L. B. Wilson.

Association of Mining Electrical Engineers (South Wales Branch).—Saturday, October 6th. South Wales Institute of Engineers, Cardiff. 6 p.m. Address by the chairman, Mr. T. S. Thomas.

Institute of Transport.—Monday, October 8th. Institution of Electrical Engineers, Victoria Embankment, W.C. 5.30 p.m. Presidential address by Air Vice-Marshal Sir W. Sefton Brancker.

Institution of Electrical Engineers (Western Centre).—Monday, September 8th. Merchant Venturers' College, Bristol. 6 p.m. Address by the chairman, Mr. W. J. Bache.
(North-Eastern Students' Section).—Friday, October 12th. Armstrong College, Newcastle-on-Tyne. 7.15 p.m. Address by the chairman, Mr. J. H. Hedley.

Institution of Heating and Ventilating Engineers.—Tuesday, October 9th. Caxton Hall, S.W. 6.45 p.m. "Methods of Heating and Ventilating Schools and their Influence on Health." Dr. H. M. Vernon.

Institute of Marine Engineers.—Tuesday, October 9th. Institute, The Minories. 6.30 p.m. "Turbo-charging of Internal-combustion Engines, especially Diesel Engines." Ing. A. Buchi.

Institution of Engineers-in-Charge.—Wednesday, October 10th. St. Bride Institute, E.C. 7.30 p.m. Address by the president, Mr. H. G. Burford.

Institute of Fuel.—Wednesday, October 10th. Burlington House, Piccadilly, W. 6 p.m. "Automatic Combustion Control." Mr. T. A. Peebles.

Overhead Lines Association.—Wednesday, October 10th. Wellington Rooms, 105, Victoria Street, S.W. First conversazione (overhead line exhibits).

International Motor Exhibition. — October 11th-20th. Olympia, W.

Diesel Engine Users' Association.—Friday, October 12th. "Marine Oil Engines." Mr. S. B. Freeman.

The "Electrical Review" Service Department.

Inquiries must be accompanied by a stamped addressed envelope.

We should be glad to learn the names and addresses of makers of the following:—

Conduit fittings marked ⊕
Lamneck laundry dryer.

Notes.

The Fuel Conference.

Delegates Hurt.—While the German members of the World Power Fuel Conference were motoring from London to Derby, one of the motor-cars collided, at Stoke Bruerne, with a motor lorry. There were six passengers in the car. Dr. Hans Just, of Dresden, was cut on the head by glass, and his father, Geheimrat Just, was much shaken. Dr. E. Burchagen was slightly cut. These three gentlemen—all associated with the Sächsische Werke, Dresden—were medically treated at Northampton, and continued their journey to Derby by train, arriving some hours after their compatriots. Dr. Hans Just's head had to be heavily bandaged, and it was by dint of determination that he continued his journey.

Mr. R. H. Gummer (assistant general manager of International Combustion, Ltd.) was with the German delegates during their inspection of the pulverised fuel plant at Derby, which aroused their keen interest. After civic entertainment, they went on to Manchester, where they were to see, *inter alia*, the Wood boiler.

All-Electric House Costs.

We have received from Mr. H. E. Todd the results of a twelve months' running of his all-electric house at 34, Harcourt Road, Accrington. The house is of average size, with three bedrooms, two reception rooms, bathroom, kitchen, attic

and garage. The residence is normally occupied by three persons. Electric room heating, water heating, cooking and lighting are provided, and no coal, gas or oil has been used for any purpose whatever. In the kitchen is installed a medium-size cooker with two solid boiling plates and a griller. Plugs are also fitted for a separate griller, toaster, iron, steamer, kettle, and a small immersion heater for small quantities of liquid. The average cost of electric cooking, including bread baking, works out at 10d. per week. The house is fitted with a standard hot-water system, the copper cylinder being fitted with two immersion heaters with a total loading of 5 kW. These heat the water to 110 deg. F. in 55 min. on the coldest winter day. This system is used only for bath purposes, and is controlled from the kitchen by two separate switches and pilot lights. The bathroom basin is fitted with a 6-kW heater, which will give boiling water in 26 sec., and there is a similar heater in the kitchen, where there is also fitted a 10-gal. storage tank, which is controlled by a two-way switch, each way controlling 150 W. Each room is well illuminated, but no special arrangements have been made in this respect. The drawing room is equipped with a 3-kW radiator and low-temperature tubular heaters; seven feet of the latter are fixed under the window and two feet at the bottom of the door. A sufficient temperature is reached in three-quarters of an hour to allow 1½ kW to be switched off. The total consumption for the whole house for the year amounted to 8,576 kWh, 5,854 kWh for room heating, 1,441 water heating, 1,015 cooking, and 266 lighting. The tariff is 15 per cent. of the ratable value of the house, plus ½d. per kWh, with the result that the average cost per week works out at 8s. 2d., 6s. 11d. unit charge, and 1s. 3d. r.v. charge.

Whitworth Scholarship Awards.

The following awards have been made under the "Regulations for Whitworth Scholarships, 1928"; Whitworth scholarships (£125, tenable for three years)—Leslie I. Farren, electrical fitter apprentice, H.M. Dockyard, Portsmouth (Dockyard School); Wm. G. Onslow, electrical fitter apprentice, H.M. Dockyard, Chatham (Dockyard School and Gillingham Medway Technical College); Wm. H. Stonelake, electrical fitter apprentice, H.M. Dockyard, Devonport (Plymouth Technical College).

Embankment Subway Fire Inquiry.

The inquiry into the cause of the recent fire in the subway at Victoria Embankment was resumed on September 27th and October 1st. Mr. Edward Gomersall, deputy superintending engineer, London District, Post Office, said that the effects of the fire on the P.O. cables were disastrous; 46 working P.O. cables were destroyed. He was satisfied that the fire must have originated in the subway. He believed that the hottest point of the fire was where the L.C.C. power cables were carried to a cut-out box, and it was his opinion that the box and the entering cables constituted the area where the fire started. Mr. Dymes, for the L.C.C., did not accept the P.O. evidence as to the origin of the fire, nor did the authorities subscribe to the allegation that the system employed for lighting the Embankment was defective. Mr. Alfred Roberts, electrical engineer to the Corporation, said that the L.C.C. lighting mains were not in accordance with modern practice, but he could not definitely give the cause of the fire. On October 1st Dr. F. J. Waldo, the City Coroner, said he had received a message relating to a subway fire which occurred the previous day 160 yards east of the one under consideration—making the third fire. He adjourned the inquiry until October 10th, when he would take evidence on the new outbreak.

The Women's National Specification.

We have received from Miss C. Haslett, director of the Electrical Association for Women, a copy of the Women's National Specification which has been prepared in connection with the Electrical "Outlet" Campaign that the Association has undertaken; it is intended to represent the woman's point of view to electrical authorities, architects and builders in connection with the wiring of new houses. Meetings are being held in connection with the campaign by the branches of the E.A.W., commencing at Birmingham, yesterday, and Manchester on October 23rd.

The specification is concise and to the point; it is based on the plan of a house as approved by the Minister of Health, and indicates the number of outlets that the Association considers necessary for an electrical labour-saving house. The Association advocates the adoption of the B.E.S.A. standards, with provision for earthing in the bathroom, scullery and kitchen, and emphasises the necessity of employing responsible electrical contractors to do the work. The specification gives plans of the ground and first floors, showing the positions recommended for the outlets, which, in addition to one good lighting point in each room, are distributed as follows: Kitchen-scullery, 3; living room, 2; parlour, 2; hall, 1; bedrooms, 2 in each; bathroom, 2; landing, 1. Copies of the specification are being sent to architects, builders, and housing authorities.

Some twenty-five housing estates have been visited by members of the E.A.W., to ascertain what provision is made for electrical service; electric light was generally installed, but little or no provision was made for power. The builder usually regarded the provision of outlets as a luxury; active commercial interest was lacking on the part of some of the electricity supply authorities, and the need for more women demonstrators to teach the housewife how best to use her electrical apparatus was realised. It was obvious that a good deal of educational work had still to be done.

Institute of Metals.

The Institute of Metals has just issued the new session's programme of the Institute and of its Local Sections. An outstanding meeting is that planned for March 6th, when the "coming-of-age" celebrations of the Institute will be held in London under the presidency of Dr. W. Rosenhain, F.R.S. The programme of the six Local Sections of the Institute are very comprehensive, and cover in all 42 papers and meetings. Several of the papers will be discussed at joint sessions with other bodies. A novel meeting is the one arranged by the London Local Section to discuss "Some Present Day Metallurgical 'Tools' and Methods," the latter including the X-ray spectrometer, quantitative spectroscope analysis, high magnification microscopy, the dilatometer, and the preparation of some unusual metallographic specimens.

A New Application for Lifting Magnets.

The electric lifting magnet, while chiefly employed for the handling of magnetic materials, can also be applied to the demolition of obsolete engineering plant. In this type of work the best results are obtained by using a breaker ball in conjunction with a circular type lifting magnet. The

"Witton-Kramer" Magnet During Demolition.

magnet is slung from the most convenient type of hoisting gear available, and as large a drop as possible is allowed between the breaker ball and the plant to be demolished. Work of this description has recently been undertaken in a large works in the Midlands, where an obsolete 1,000-h.p. triple-expansion steam engine has been replaced with up-to-date electrical gear. The whole of the plant used in demolishing this engine was manufactured and supplied by the Witton Kramer Electric Tool and Hoist Works, of the General Electric Co., Ltd., and included a double-drum worm-geared hoist block, having a maximum capacity of 5 tons, a 36-in. diameter electro-lifting magnet, and a steel ball weighing 25 cwt. The accompanying illustration is of the breaking-up process.

Fuel Economy and the Lay Press.

The following letter was received too late for insertion in our "Correspondence" columns:—

World Power Conference.

As reference is made in your issue of the 28th inst. to the publication of information contained in the paper entitled "Economic Utilisation of Fuel in the Production of Electricity" before such paper was read, I give below an extract from a letter I wrote to the daily Press on the 24th inst. with reference to the various articles which had recently appeared:—

"As certain of these articles convey the impression that I have given information to the Press and expressed opinions other than those contained in the paper referred to, I desire to state that I have not given an interview to any Press representative, nor have I had any communication or correspondence whatsoever with the Press in connection with any of the subjects dealt with in the paper.

"I should be much obliged if you could give prominence to this letter, as I entirely disagree with some of the statements which have been attributed to me, and opinions which have been published."

The letter referred to appeared in certain issues on September 25th.

R. P. Sloan.

Newcastle-upon-Tyne, *October 1st*, 1928.

As we pointed out in our leading article last week, there was nothing in Mr. Sloan's paper to justify the absurd anticipations which appeared in the lay Press. We refer to the matter again in our leading columns to-day.

Explosion at L.M. & S. Railway Works.

An explosion, followed by fire, occurred on October 1st at the L.M. & S. Railway telegraph and electrical works, Crewe. The building where the explosion occurred contains machinery used in the making of telegraph instruments. The repairs necessary are chiefly structural, and only one machine has been badly damaged. The cause of the explosion has not yet been discovered.

Fatalities.

Whilst employed at the Caroline Port power station of Dundee Corporation, on September 25th, Robert Milne fell against live apparatus and received a fatal electric shock. A short-circuit resulted, and the tramway system was at a standstill for three-quarters of an hour.

Three Italian airmen were killed by a h.p. transmission line and their machine wrecked on September 29th, near Valence, in the Rhone Valley. The hydroplane struck a cable from the Vercors power station and fell into the River Rhone. It is surmised the airmen were killed instantly, receiving a shock of 30,000 V.

Colliery Electricians and Compulsory Certification.

At a meeting of the Midland Branch of the Association of Mining Electrical Engineers, at Mansfield, under the presidency of Mr. R. Wilson, a discussion took place regarding the recommendation of the committee appointed by the Mines Department as to the qualifications of mechanical and electrical engineers, and a resolution was adopted in favour of the compulsory certification of all colliery electricians, in view of the rules and stringent electrical tests which they are required to carry out under the Coal Mines Regulation Act.

Turbo-Electric Vessels.

Captain Robert Dollar, president of the Dollar Steamship Line, announced on September 18th that his company would build two turbo-electric liners for trans-Pacific service. The ships will be after the pattern of the Panama Pacific liner *California*, a 22,000-ton ship operating between San Francisco and New York. Captain Dollar said the ships would cost 7,000,000 dollars each, and it was possible that the two new liners would be followed later by an entire fleet of electrically-driven ships for the Far-Eastern service. The new ships are made possible by Government aid under the Jones-White Merchant Marine Act passed by Congress.—*Reuter's Trade Service* (New York).

Appointments Vacant.

Shift charge engineer (96s.) for the Colchester Corporation Electricity Department. Chief repair shop and maintenance foreman for the power house at Kalyan, near Bombay, for the Indian State Railways. Assistant engineer (£250+) for the Grays Thurrock U.D.C. Electricity Department. Teacher of advanced electrical engineering for the Hackney Technical Institute. Meter tester and mechanic for the Paisley electricity undertaking. Working leading station electrician (90s.) for the Bermondsey Borough Council Electricity Department. L.p. cable jointer for Sutton Coldfield Corporation Electricity Department; power sales assistant for the Manchester Corporation Electricity Department. Station superintendent (£400) for the Nuneaton Corporation Electricity Department. Meter tester, fixer and installation inspector for the Ilkley U.D.C. Electricity Department. Assistant to the electrical engineer (£500) for the City of Chester Electricity Department. (See our advertisement pages to-day.)

An "All-Electric" Farm.

On October 6th Mr. R. Borlase Matthews's all-electric farm will be visited by the Brighton Division of the British Medical Association. It is expected that about 70 guests will take part in the visit.

Association of Supervising Electrical Engineers.

On October 2nd, Mr. S. B. Donkin, M.I.E.E., delivered his presidential address, "History and Development of the Electricity Supply Industry Under the 1919 and 1926 Acts, with some Special Reference to the Scottish Scheme of the Central Electricity Board," before the Association of Supervising Electrical Engineers. He traced the "legislative" side of the industry from the establishment of the Electricity Commission in 1919 to the preparation of the area "grid" schemes by the Central Electricity Board. He outlined the technical details of the Central Scottish scheme. The total length of the transmission line (132,000 V, 3-phase) is about 253 miles, of which 220 are single-circuit and 33 double-circuit lines. Steel-cored aluminium conductors are used, consisting of seven 0.11 stranded steel cores surrounded by thirty 0.11 aluminium conductors. The normal span is 900 ft. and the sag is 23 feet, with 22 ft. lowest ground clearance. The conductors are supported on insulation strings containing 9 and 10 units in series. Local corona would not occur under normal atmospheric conditions under approximately 167,000 V, and decided corona until about 190,000 V between phases had been attained.

Traffic Control in Coventry.

Coventry is shortly to establish at one of its important road crossings a fully automatic system of traffic control. Coloured signal lamps on conveniently placed standards will be time-switch controlled. The signals will be so arranged that the lights will allow traffic to flow from north to south and south to north, while that from east to west and west to east is held up, and *vice versa*. A central caution lamp will light up while the signals are changing.

Institution Notes.

Institution of Electrical Engineers.

The new session commences on October 25th, when the president, Lt.-Col. K. Edgcumbe, T.D., R.E.T. (Ret.), will deliver his inaugural address. On November 8th Mr. W. B. Woodhouse will give an account of the work of the Electrical Research Association on "Overhead Electric Lines," illustrated with a kinematograph film. A joint meeting with the British Institute of Radiology will be held on November 22nd, when Mr. L. G. H. Sarsfield, M.Sc., will read a paper on "The Electrical Equipment of X-Ray Apparatus." On December 6th Messrs. A. E. Foster, P. G. Ledger, and A. Rosen, Ph.D., will give a paper on "The Continuously Loaded Submarine Telegraph Cable," and on December 20th Messrs. E. B. Wedmore, W. B. Whitney, B.Sc., and C. E. R. Bruce, M.A., B.Sc., will present "An Introduction to Researches by the Electrical Research Association on Circuit-Breaking."

The annual dinner will be held on February 7th, and the Kelvin Lecture will be delivered by Dr. G. C. Simpson, F.R.S., on "Lightning."

Institute of Transport.

The first ordinary meeting of the 1928-29 Session will take place at the Institution of Electrical Engineers, London, on Monday, October 8th. Prior to inducting his successor, Air Vice-Marshal Sir W. Sefton Brancker, K.C.B., A.F.C., the retiring president, Mr. Roger T. Smith, will present premiums; one of these, the Railway (Operating) Gold Medal, has been awarded to Mr. E. C. Cox, C.B.E., M.V.O., for his paper on "Southern Railway Electrification." The incoming president will take as the subject of his inaugural address "Commercial Aviation in relation to other forms of Transport."

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

At the Tramway Offices, Thornton Heath, on Friday last, the principal officers and a large number of all grades of the Croydon Corporation Tramways staff made a presentation to Mr. T. B. Goodyer, the retiring tramway manager, of tokens of the respect and esteem in which he is held. The gifts consisted of a silver salver and a three-valve wireless set complete with loud speaker. The formal presentation was made by Mr. W. H. Troake (Stores Supt.) and Mr. F. C. Goddard (Chief Inspector), both of whom spoke in high terms of the regard in which Mr. Goodyer has been held by the staff throughout his long period of service. Mr. Goodyer, in acknowledging the gifts, expressed the hope that the staff would extend to his successor the same measure of support as they had shown to him.

On September 29th Dr. S. Z. de Ferranti was the guest of the Manchester College of Technology, and was elected to the Associateship of the College.

According to *The Times*, Mr. R. S. Lea, the general consulting engineer on the development of the St. Lawrence River for power and navigation, arrived at the Langham Hotel from Canada last week.

Subject to the consent of the Manchester City Council, the Tramways Committee is to advertise for a general manager and chief engineer to succeed the late Mr. Henry Mattinson. The position carries a salary of £2,000. There have been proposals that the positions of general manager and chief engineer should be separate ones.

Councillor H. J. Galliers, who is so well known to members of the Electrical Contractors' and Allied Associations, and many others connected with the electrical trade, was last week elected Mayor of Brighton for the coming year, and we offer him our congratulations. In 1900 Mr. Galliers founded the business of electrical engineer and contractor at Brighton, and he is now established not only there, but also at Hove, Worthing, Lewes, Haywards Heath, and London. He has

Councillor H. J. Galliers,
Mayor-Elect of Brighton.

been chairman of the Brighton Corporation Lighting Committee for the past two years. He was responsible for the formation of the Sussex Branch of the Electrical Contractors' Association in 1919, was chairman of the Branch in 1922 and 1923, and has been a member of the Council of the E.C.A. since 1924. He is chairman of the Southern Section this year. Mr. Galliers played no small part in ensuring the success of the social arrangements for the First Annual Convention of the E.C.A. held at Brighton two years ago.

The London and Home Counties Joint Electricity Authority, at its meeting held on September 26th, elected Mr. B. J. Samels, J.P., L.C.C., as vice-chairman in succession to Alderman Major C. R. Attlee, M.A., M.P., who has retired on account of his work as a member of the Indian Statutory Commission. Mr. Samels has been mayor of Hammersmith since 1926, and a member of the London County Council for South Hammersmith since March, 1925. He has been a member of the Joint Electricity Authority since its inauguration in 1925, and is the present chairman of the Finance Committee of the Authority. He is chairman of the District Joint Board of the Electrical Supply Industry (Area No. 10); chairman of the Traffic Sub-Committee of the Metropolitan Boroughs Standing Joint Committee; and chairman of the Street Safety Committee of the London Safety First Council.

Councillor B. Pearlman, Lord Mayor-elect of Hull, is chairman of the Corporation Electricity Committee.

The *Daily Mail* states that Commander E. L. C. Grattan, D.S.O., R.N., has been appointed assistant controller in charge of the cable room of the Central Telegraph Office, London, in succession to Mr. F. T. Wadley, who is retiring.

Mr. D. McDougall, who has been acting as chief engineer and manager of Greenock Corporation Electricity Department, has been fully appointed to the position at a salary of £850 per annum.

The marriage took place at Mansfield, on September 15th, of Mr. Leslie R. Hill, electrical engineer at the Peasley Vale Works of William Hollins & Co., Ltd., and Miss E. V. Cutts. Mr. Hill received a clock from the engineers' department and a beaten pewter fruit bowl from the staff.

The marriage took place at Colchester, on September 20th, of Mr. F. J. Chignell, of the staff of the Colchester Corporation Electricity Department, and Miss E. F. Loyd.

Mr. H. Talbot has relinquished his position as general manager of the Welsbach Light Co., Ltd., and is now general manager of the Non-Inflammable Film Co., Ltd.

Obituary.—Mr. R. Mansel.—Intimation has reached this country of the death of Mr. Robert Mansel, who was well known in Scottish engineering circles. A son of the late Mr. Robert Mansel, Glasgow, who was associated with the late Lord Kelvin and a partner in Messrs. Aitken & Mansel, thirty years ago, Mr. Mansel, jun., joined the Natal Government Railway, and later started business on his own account. A brother, who was for many years chief electrical engineer to De Beers, died in September of last year.

Dr. Robert Knox.—One of the pioneers of X-ray treatment, Dr. Robert Knox, died on September 21st. A student of radiology throughout his career, he had held various important appointments, and was in the front rank of his profession. He made a special study of the treatment of cancer with X-rays and radium, and contributed to the literature of medical electricity, being president of the Electrotherapeutic Section of the Royal Society of Medicine and of the Röntgen Society, vice-president of the British Institute of Radiology, and editor of the *British Journal of Radiology*.

Mr. J. C. Lucas.—Mr. John Charles Lucas, of Margate, who was for many years on the staff of the Commercial Cable Co., died suddenly on September 26th, at the age of 60 years.

Herr M. Baldamus.—The death recently occurred of Herr Max Baldamus, director of the technical bureau in Magdeburg, Germany, of the Siemens-Schuckertwerke.

Will.—The late Mr. S. E. Day, borough electrical engineer of Bury St. Edmunds, left £6,199 net, and £6,290 gross, personalty.

Financial Section.

New Companies, Returns of Share Capital, Debenture Changes, Reports of Electrical Companies, Dividend Results, Transactions in Stocks and Shares.

New Companies Registered.

G. Yeldon, Ltd.—Private company. Registered September 20th. Capital, £2,000 in 4,000 ordinary shares of 5s. each and 1,000 preference shares of £1 each. Objects: To acquire the business of a radio engineer and manufacturer carried on by Gerald Yeldon at 20, New Road, Portsmouth. The first directors are: Gerald Yeldon and George Yeldon, 58a, London Road, Portsmouth, radio apparatus manufacturers. Gerald Yeldon is to be managing director for 10 years with a commencing salary of £250 per annum. Registered office: 20, New Road, Portsmouth.

Insulated Wires, Ltd.—Private company. Registered September 24th. Capital, £100 in 1s. shares. Objects: To carry on the business of manufacturers, importers, and exporters of and dealers in all kinds of insulated and bare wires, cables, flexibles, mechanical, galvanic and optical appliances, &c. The subscribers (each with one share) are: H. J. Kennedy, "Burwood," Robinson Road, S.W.17, electrical engineer; W. J. Hawkins, "Shiloh," Lime Avenue, Leigh-on-Sea, Essex, merchant. The first directors are not named. Solicitor: F. C. H. Jones, Bank Chambers, 329, High Holborn, W.C.1.

Radia Electric Co. (Gloucester), Ltd.—Private company. Registered September 19th. Capital, £100 in £1 shares. Objects: To acquire the business of an electrical, telephone and radio engineer carried on by H. W. Haydon, at 158, Bristol Road, Gloucester. The first directors are: H. W. Haydon, 158, Bristol Road, Gloucester; Mrs. F. A. Perks, 68, Southgate Street, Gloucester. H. W. Haydon shall be managing director for three years, with £360 per annum and 10 per cent. of the annual profits as remuneration. Registered office: 158, Bristol Road, Gloucester.

Hassocks and Hurst Electricity Co., Ltd.—Registered as a public company, September 24th. Capital, £5,000 in £1 shares. Objects: To carry on the business of an electric light and power company in all its branches, &c. The minimum cash subscription is 500 shares. The directors are: K. A. S.

Moncrieff, The Clough, Oxted, Surrey; E. H. F. Reeves, Field House, Friern Park, N. Finchley; J. Eustace, Elmhurst, London Road, Chelmsford; J. N. A. Houblon, Boxford, Newbury, Berks.; G. C. Stowell, Glendale, Church Road, Hanwell, Middlesex. Registered office: 424, Salisbury House, London Wall, E.C.2.

Light Radiators, Ltd.—Private company. Registered September 28th. Capital, £100 in £1 shares. Objects:—To carry on the business indicated by the title and to promote, participate in and subsidise investigations, inquiries and research work into the improvement of, or substitution of, existing secret processes or inventions relating to chemical, mechanical, or electrical processes, &c. The subscribers are:—Lily F. Darwell Stone, 205, Oxford Street, W.1, clerk; R. A. Curtis, 7-8, Great Winchester Street, E.C.3, clerk. Solicitor: Lucien Fior, 205, Oxford Street, W.1.

E. R. Morton, Ltd.—Private company. Registered September 28th. Capital, £1,000 in £1 shares. Objects:—To carry on the business of manufacturers of and dealers in electrical and radio goods and appliances, articles, novelties, &c. The subscribers (each with one share) are:—B. W. W. Booth, "The Chalet," Sutherland Avenue, W.9, articled clerk; S. Wood, 152, High Road, Leyton, E.10, clerk. The first directors are not named. Solicitors: Roche, Son & Neale, 1, Church Court, Old Jewry, E.C.

Cine-Sound, Ltd.—Registered as a private company September 27th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in plant and apparatus for the recording of sound in synchronisation with cinematograph films, photographs and pictures, or independently thereof, cameras, projectors, gramophones, records, wireless apparatus and accessories, motors, batteries, amplifiers, &c. The director are: C. Solkhon, 5, Larkswood Road, South Chingford, company secretary; A. J. Keeble, "Brooklyn," Sheaveshill Avenue, Hendon, N.W.9, company secretary. Registered office: 14, Coleman Street, E.C.2.

London-Calcutta Mica Co., Ltd.—Registered as a private company September 26th. Capital, £11,000 in 1s. shares (200,000 8 per cent. non-cumulative preference and 20,000 ordinary). Objects: To acquire and turn to account any mica, manganese, iron, copper, zinc, lead, tin, or any other minerals, metalliferous land, mining rights, &c., in any part of the world. The subscribers (each with one preference share) are: H. L. Burnham, Africa House, 44-46, Leadenhall Street, E.C.3, merchant; Capt. J. V. Hermon, Wargrave, Berks. Solicitors: Lawrance Messer & Co., 14, Old Jewry Chambers, E.C.2.

Allan Boyle & Co., Ltd.—Private company. Registered in Edinburgh September 22nd. Capital, £1,000 in £1 shares. Objects: To carry on the business of mechanical, electrical, and general engineers, &c. The subscribers (each with one share) are: Allan Boyle, 10, Strathmore Gardens, Hillhead, Glasgow, engineer; W. George Gunn, 19, Rosebank Street, Dennistoun, Glasgow, engineer. Secretary: A. Boyle, pro tem. Registered office: 98, Duke Street, Dennistoun, Glasgow.

Official Returns of Electrical Companies.

Clear Hooters, Ltd.—Particulars filed of £1,900 debentures authorised August 31st, 1928, charged on the company's undertaking and all its property (subject to first mortgage debentures "A," "B," and "C," issued or to be issued for sums not exceeding in the aggregate £1,300), the amount of the present issue being £1,039. Also first debenture dated September 8th, 1928, to secure £300, charged on the company's undertaking and property (subject to first mortgage debentures "A" and "B" issued or to be issued for sums not exceeding in the aggregate £1,000). Holder: J. H. Mills, Heath Lea, Castle Bromwich.

Satisfaction on August 31st, 1928, (1) in full of second mortgage debenture dated October 19th, 1927, securing £300, and (2) to the extent of £4,156 7s. 1d. of third debentures dated May 5th, and July 18th, 1927, securing £5,537 16s. 6d.

Hastings and District Electric Tramways Co., Ltd.—Capital, £372,942 10s. in 130,000 preference shares of £1 each and 485,885 ordinary shares of 10s. each. Return dated May 29th, 1928. 80,000 preference and 268,235 ordinary shares taken up. £200,000 paid on 80,000 preference and 240,000 ordinary shares, £14,117 10s. considered as paid on 28,235 ordinary shares. Mortgages and charges at date of return: £450,000 4½ per cent. debenture stock; since registered, £130,000 notes, and premium of 15 per cent. (authorised February 29th, 1928, and all issued June 15th, 1928).

Greenwood & Batley, Ltd.—Capital, £600,000 in 140,000 preference, 354,585 ordinary, and 105,415 unclassified shares of £1 each. Return dated July 16th, 1928. 110,660 preference and 354,585 ordinary shares taken up. £201,273 paid (being £1 per share on 69,340 preference and 121,340 ordinary shares, 6s. per share on 14,660 preference, and 10s. per share on 12,390 ordinary shares, £247,515 considered as paid on the remainder. Mortgages and charges: £100,000.

Connollys (Blackley), Ltd.—Satisfaction in full on July 23rd, 1928, of three debentures dated September 18th, 1919, March 9th, 1920, and April 12th, 1922, securing £15,000, £10,000, and £5,000 respectively. Also satisfaction in full on same date of debentures dated January 17th, 1923, securing £16,150 and premium of £5 for every £95, of which only £2,945 was issued.

Mevagissey Electric Supply Co., Ltd.—Capital, £5,000 in 4,433 preference shares of £1 each and 1,134 ordinary shares of 10s. each. Return dated May 7th, 1928. All shares taken up. £336 15s. paid (being £1 per share on 280 preference and 2s. 6d. on 454 ordinary), £4,663 5s. considered as paid (being £1 per share on 4,153 preference, 10s. per share on 680 ordinary, and 7s. 6d. per share on 454 ordinary). Mortgages and charges: £1,994 8s.

Callender's Cable and Construction Co., Ltd.—Capital, £1,800,000 in 400,000 preference, 400,000 "B" preference, and 1,000,000 ordinary shares of £1 each. Return dated July 12th, 1928. 400,000 preference, 400,000 "B" preference, and 800,000 ordinary shares taken up. £1,125,000 paid, £475,000 considered as paid. Mortgages and charges: £300,000.

Electric and General Investment Co., Ltd.—Capital, £201,500 in 19,900 preference and 20,000 ordinary shares of £5 each, and 40,000 deferred shares of 1s. each. Return dated July 23rd, 1928. All shares taken up. £121,500 paid (being £5 per share on the preference, £1 on the ordinary, and 1s. on the deferred shares). Mortgages and charges: £7,822 10s.

Chamberlain & Hookham, Ltd.—Capital, £100,000 in 9,500 preference and 10,500 ordinary shares of £5 each. Return dated June 26th, 1926. 8,000 preference and 10,100 ordinary shares taken up. £36,990 paid on 7,298 preference and 100 ordinary shares, £53,510 considered as paid on 702 preference and 10,000 ordinary shares. Mortgages and charges, nil.

Wark and District Electric Lighting Co., Ltd.—Capital, £1,500 in £1 shares. Return dated August 2nd, 1928. All shares taken up. £1,500 paid. Mortgages and charges, nil.

Kalgoorlie Electric Tramways, Ltd.—Capital, £250,000 in £1 shares. Return dated July 26th, 1928. All shares taken up. £250,000 paid. Mortgages and charges: £122,350 and interest accrued on 6 per cent. "B" stock from April 1st, 1912.

Rose Bros. Electrical Co., Ltd.—S. G. Morris, 6, Wardrobe Place, Doctors' Commons, E.C., ceased to act as receiver or manager on September 20th, 1928.

Barnes Bros. (Radiex), Ltd.—A. H. Ballard, 90, Fenchurch Street, E.C.3, ceased to act as receiver or manager on September 19th, 1928.

Scintillating Sign Co., Ltd.—A. H. Partridge, 3, Warwick Court, Grays Inn, W.C.1, ceased to act as receiver or manager on June 6th, 1928. (Notice filed September 19th.)

Telegraph Condenser Co., Ltd.—Capital, £5,000 in £1 shares. Return dated June 7th, 1928. 2,000 shares taken up. £2,000 considered as paid. Mortgages and charges, nil.

Hart Accumulator Co., Ltd.—Capital, £200,000 in 20,000 preference and 180,000 ordinary shares of £1 each. Return dated July 11th, 1928. 19,523 preference and 156,708 ordinary shares taken up. £38,411 paid, £137,820 considered as paid. Mortgages and charges, nil.

Teignmouth Electric Lighting Co., Ltd.—Capital, £50,000 in 20,000 cumulative 7 per cent. preference and 30,000 ordinary shares of £1 each. Return dated June 1st, 1928. 18,703 preference and 28,615 ordinary shares taken up. £46,818 paid, £500 considered as paid. Mortgages and charges: £12,500.

New System Private Telephones, Ltd.—Capital, £20,000 in £1 shares. Return dated August 2nd, 1928. 15,000 shares taken up. £13,000 paid, £2,000 considered as paid. Mortgages and charges, nil.

Kidderminster and District Electric Lighting and Traction Co., Ltd.—Capital, £100,000 in 5,000 preference and 5,000 ordinary shares of £10 each. Return dated July 11th, 1928. 5,000 preference and 4,700 ordinary shares taken up. £97,000 paid. Mortgages and charges, nil.

Midland Electric Corporation for Power Distribution, Ltd.—Satisfaction in full on August 30th, 1928, of mortgage and charge by way of trust deed dated May 30th, 1913, securing debenture stock for £400,000 with power to increase up to £500,000.

Delhi Electric Supply and Traction Co., Ltd.—Satisfaction in full on or before June 20th, 1928, of debentures secured by trust deed dated January 3rd, 1908, securing £50,000.

I.T.C., Ltd.—Capital, £20,000 in £1 shares. Return dated August 2nd, 1928. 15,000 shares taken up. £15,000 paid. Mortgages and charges, nil.

West African Telegraph Co., Ltd.—Capital, £490,000 in £10 shares. Return dated July 19th, 1928. 23,109 shares taken up. £231,090 paid. Mortgages and charges, nil.

Electric Sign Co., Ltd.—Capital, £5,000 in £1 shares. Return dated July 23rd, 1928. 2,000 shares taken up. £1,000 paid, £1,000 considered as paid. Mortgages and charges, nil.

Lincolnshire Motor and Electric Traction Co., Ltd. (old company).—A. G. Pearson, 1, Town Hall Street, Grimsby, ceased to act as receiver or manager on September 25th, 1928.

City Notes.

Baird International Television, Ltd.

Speaking at the statutory meeting on September 25th, the chairman (Lord Ampthill) mentioned the formation of an American company by Television, Ltd., for the exploitation of the Baird patents in the United States, Canada and Mexico. Negotiations were proceeding for the formation of a company in Holland, and other companies would probably be constituted in Spain and Australia. The chairman hoped that as many shareholders as possible would attend the demonstrations which were being given in connection with the Radio Exhibition at Olympia.

Associated Gas and Electric System.

The total income of this group for the year ended June 30th last was $41,368,723, an increase of $8,992,493. The net earnings rose by $3,311,610 to $18,267,065. After meeting preferred dividends, interest, replacement and renewal charges, &c., a balance of $6,147,183 is available for dividends and surplus, an increase of $1,189,994.

Companies Struck off the Register.

The names of the undermentioned companies have been struck off the register and they are thereby dissolved :—

Associated Battery Co., Ltd.
Coventry Electric Clock Co., Ltd.
Electric Gyroscope Kinematograph Camera Co., Ltd.
International Communications, Ltd.

Associated Fire Alarms, Ltd.

The profit for the year ended June 30th last, after making provision for income tax, was £5,946; the addition of the balance brought forward makes available £7,592. Of this, £2,000 is to be transferred to reserve, and after the payment of a dividend of 8 per cent., £1,932 is carried forward.

Bermuda Traction, Ltd.

The statutory meeting was held on September 28th. Mr. A. E. Hadley, C.B.E. (vice-chairman), who presided, said that they had received satisfactory reports of the prospects; the attitude of the local authorities was friendly; and arrangements had been made for the early prosecution of the construction programme.

West London and Provincial Electric and General Trust, Ltd.

Interim dividends of 2½ per cent. actual on the preference stock and 4½ per cent. actual (against 4 per cent.) on the ordinary stock have been declared.

Montreal Light, Heat and Power Consolidated.

A dividend of 60 cents per share has been declared on the common shares for the quarter ended September 30th.

Shanghai Electric Construction Co., Ltd.

An interim dividend of 5 per cent. (actual), free of tax (against 4 per cent.) has been declared.

Pernambuco Tramways and Power Co., Ltd.

The *Financial Times* reported last week that the Electric Bond and Share Co. had purchased the control from the English company of the Pernambuco Tramway, Light, Power and Telephone Co.

Shropshire, Worcestershire, and Staffordshire Electric Power Co.

The directors announce the payment on November 1st of an interim dividend on the "A" ordinary shares of 4 per cent. (actual), less tax.

Associated Telephone and Telegraph Co.

A dividend of $1.75 per share has been declared on the 7 per cent. preferred stock for the quarter ended September 30th.

French Companies.

The *Etablissements Electro-Mécaniques*, Strasbourg, reports net profits and balance forward amounting to 178,000 fr. for 1927, as compared with 328,000 fr. in the previous year; the dividend is reduced from 8 per cent. to 6 per cent.

The *Etablissements Industriels de E.C. Grammont et de Alex. Grammont* has decided to pay a dividend of 6 per cent. for 1927-28, against *nil* in the preceding year. The net profits amounted to 7,201.000 fr., including the balance forward.

The *Société d'Electricité de Paris* reports net profits of 10,428,000 fr. for 1927-28, and proposes to pay a dividend of 75 fr. per share. The sales from the Saint Denis station rose to 282,633,000 kWh.

German Loan in New York.

The Frankfurt correspondent of *The Times* states that the Rhenish Westphalian Electricity Works, Essen, has concluded negotiations with the National City Company, New York, for a loan of $20,000,000 6 per cent., 25-year bonds.

P. & W. MacLellan, Ltd.

The directors have decided to defer the consideration of a dividend on the company's 6 per cent. cumulative preference shares until the close of the financial year.

Stocks and Shares.

Monday Evening.

Stock Exchange markets started with vigour and with animation the final quarter of the calendar year. Public interest in stocks and shares gives no indication of slackening. Newspaper critics cry in one column for caution, and, parallel to the dangers that this proclaims, are other columns in which the attractions of various speculative ventures are prominently set out. The tipster is having, in slang phrase, the time of his life. So is the company promoter, who finds a public ready to take almost any wares which offer an opening for profit-snatching. And the curious part of the matter is that investment, pure and simple, continues to draw a satisfactory volume of business. The cash required for the financing of the boomlet in speculative descriptions is not being withdrawn from better-class securities, or, if it is, there is plenty of support from new buyers of the latter stocks and shares. Within the past few business days a fresh impetus has been given to the market for electrical equipment shares, and prices are being raised to levels that bear no relation to the dividends at present distributed by the good and old-established companies.

Electricity Supply.

Summer-time comes to an end in the early hours of next Sunday morning, and even the learned Einstein himself would doubtless admit that this is a consideration in favour of illumination securities. Shares in the London electricity supply companies offer so little scope for improvement in value that it is not surprising to find the list of prices is practically unchanged. South Londons are 6d. up to 27s. 6d., so coming into line with most of the others in their group. Newcastle-on-Tyne subsided 2s. after their last week's very abrupt rise of 3s. 9d. The statements made at the World Fuel Conference, while profoundly interesting, did not suffice to stem a stream of profit-taking sales. Electric Supply Corporation shares are 1s. 3d. higher at 53s. 3d. The issue of what are called Belgian Electric 5½ per cent. at 91 achieved prompt over-subscription. Larger applicants received 25 per cent. of what they asked for. The market price is 93½, a premium of 2½ points. Stags were not encouraged : the application money was 25 per cent., and the balance of 66 became payable on Wednesday in this week. Hereby the company gets all its money at once, and the genuine investor who applied for the bonds because he wanted them to hold, is not worried by having his application cut down in order that the turn-snatching stag may receive an allotment which he hopes to sell at a profit to that same genuine investor.

Quotations.

Of the shares not quoted in our prices overleaf, it may be mentioned that Egham and Staines are 37s. 6d., and the new shares 6d. less. Isle of Thanet are 35s. and 28s. for ordinary and preference, respectively. North Metropolitans are 51s., after being rather higher, and Scottish Power new ordinary at 5s. 4½d. premium show no variation on the week. West Gloucestershire Power 5 per cent. debenture has advanced to 93.

To Check Stagging.

New issues are so likely to be a feature of the current three months that it may be of service to quote the example set recently by a German municipality. Coblentz offered 8 per cent. bonds last week, at 93, but the applicant who undertook to hold them for six months was charged 91. This made a distinct appeal to the investor. In many cases, however, the support of the stag division is welcomed, because companies like to see their shares eagerly subscribed by the public. The effect may be no more than sentimental. It certainly is operative, and the British Government deliberately invited stags when offering 4 per cent. consolidated stock upon which only 2 per cent. application money was required.

Eastern Quartette Strength.

The Eastern cable quartette has enjoyed another advance. Eastern ordinary went up 12½ points last week, and is 2½ higher now, at 262½. Eastern Extensions and Westerns have gained 5s. each. The largest rise, relatively, is shown by Globe ordinary, the price of which regained a deducted dividend of 5s. net, and put on 10s. in addition. Globes have lagged behind the others. The trust has large interests in the two Eastern and in the Western companies, besides holding stocks in the Anglo-American, the Mackay, and other under-

takings. Reasons for the strength of the Eastern stock and shares were given here last week, the buyers looking for reward in the anticipated sub-division of the present issues.

Meteoric Marconis.

Marconis maintain their mercurial reputation, and speculation has produced a huge turnover of shares every day. After touching 77s. 6d., the price reacted to 74s., and then hardened to the former figure. It is said, with a certain show of authority, that the Americans are large buyers of the shares. Marconi Marines eased off to 56s. The interim dividend, due this week, is expected to be 7½ per cent., against 4 per cent. a year ago. Canadians, the movements in which are swayed to no slight extent by orders from New York and Montreal, varied between 29s. 6d. and 31s. 6d., being 30s. on Monday evening. So considerable is the accumulation of week-end orders in the Stock Exchange nowadays that—if a personal sentence may be pardoned—the difficulty increases weekly of catching the last post with these market comments.

Cable Equipment.

Callenders and General Electrics have responded slightly to the news of the big contracts placed with them by the Central Electricity Board. Callenders are 1/16th higher at 4½, and the preference improved to 25s. General Electrics gained 6d. at 41s. 6d. It is assumed that other contracts on the grand scale will be given in the near future to other large cable manufacturing companies. The shares of Henley's and the British Insulated, at 5 13/16 and 4 3/16 ex dividend, are, respectively, 5s. and 9d. better on the week. From the dividend standpoint all the ordinary shares in the front-rank cable equipment undertakings give less than a gilt-edged yield on the money. Investment ignores such a consideration and retains the shares, sometimes buying more, in order to obtain possible new shares at prices that will enable a useful bonus to be obtained. Cable and electrical equipment companies are known to be, in the majority of cases, fully occupied with work. Moreover, the daily march of scientific invention makes it more and more apparent that electricity's bounds cannot be measured, and that the extension of electrical work is likely to continue indefinitely. Abroad, as well as at home, electricity galvanises ever-new interests and attracts a continuous flow of fresh capital.

Home Rails and Tractions.

British Electric Traction ordinary stock, which was on the point of removal from our price-lists because of its apparent immobility, is up 10 points this week, the price rising to 530. The London Tramway section is unchanged. Amongst Home Rails, Underground Electric income bonds are 4 down, at 125, the shares, at 26s., losing a shilling. The heaviness is due to fears of an increase in the cost of petrol, and to the desire on the part of the 'bus company's staff for re-arranged conditions of duty in certain sections. Districts are not affected. Metropolitans fell 10s. The serious labour differences in Australia have had no influence at present over the lighting and tramway shares in local companies. Melbourne Electric Supply ordinary stock is quoted at 177½, and the 8 per cent. preference shares, of £5 each, at 5¾. Adelaide 6 per cent. preference stand at 21s. 6d., and the 5 per cent. "A" preference, tax-free, at the same price. The 6½ per cent. "C" shares are 22s. 6d.

Foreign and Colonial.

In the foreign and Colonial list, Hydro-Electrics weakened to 34½, and International Holdings to 14½. As a lock-up speculation, the latter will probably pay to put by at the current figure. Mexican Light and Power preferred shares have gained 4 points at 81½, though the 5 per cent. first mortgage bonds drooped to 76½. Whitehall Electrics keep steady, the 6 per cent. debenture stock being better at 102 ex dividend. Atlas Light and Power are active round about £1, and the 7 per cent. preference change hands constantly around 22s. 6d. Burma Electric are being dealt in on the basis of 25s. Delhi ordinary were done the other day at 56s. 9d. Perak River Hydro-Electrics are 20s. middle, and the 7 per cent. participating debenture stock stands at 116½.

Telephones.

Automatic Telephones have recovered the dividend taken off the price last week, and are 43s. 9d. United River Plates have shed 10s., on renewed uneasiness as to what may be going to happen in connection with the question of rates. A rise of 8 points lifted International Telephone and Telegraph to 189. Bogota Telephones shed a shilling, the price easing to 31s. Venezuela Telephones are 25s. 3d. for the ordinary: the preference stand a few pence higher. The market in Siemens and in Johnson & Phillips is a little harder this week. Rumour says that a new manufacturing company is approaching the day of appearance.

Miscellaneous.

The iron, coal and steel market is strengthening on account of anticipations that the Government may do more than talk about additional safeguarding. Babcocks are a good market with a rise of 1/16 to 71s. 3d. Vickers do not move to any appreciable extent, but Baldwins have been good. The rubber market has no resiliency.

Share List of Electrical Companies.

	Nom.	Dividend. 1926.	1927.	Price Oct. 1, 1928.	Rise or fall.	Yield. p.c.
Home Electricity Companies.						
Bournemouth and Poole	£ 1	14†	15	3⅜	—	... ...
Brompton Ordinary	1	8⅜	8½	27/-	—	5 3 8
Charing Cross Ordinary	1	8½	8½	27/-	—	5 3 8
do. do. 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Chelsea	1	8⅝	8⅝	27/6	—	5 1 10
City of London	1	10	10	33/3	—	4 4 4
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	2	—	4 0 0
County of London	1	7½	7½	40/6	—	3 14 3
do. do. 6% Pref.	1	6	6	23/6	—	5 2 2
Edmundsons' 7% Pref.	1	7	7	25/6	—	5 9 10
Elec. Supply Corporation	1	11	11	53/3	+⅓	4 2 9
Kensington Ordinary	1	8	8	26/6	—	5 5 8
Lancs. Light and Power	1	7½	7½	30/6	—	5 0 0
London Electric	1	8½	8½	28/-	—	4 18 3
Metropolitan	1	8	9	47/-	—	3 16 9
do 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Midland Counties	1	6	6½	31/-	—	4 3 10
Mid. Elec. Power	1	—	15	40/6	—	... ...
Newcastle-on-Tyne Ordinary	1	5	6	27/6xd.	—2/-	4 7 6
do. 7% Pref.	1	7	7	26/- xd.	—	5 7 8
Notting Hill 6% Pref.	10	6	6	10¾	—	5 11 7
North Met. Elec. 6% Pref.	1	6	6	23/-	—	5 4 4
St. James' and Pall Mall	5	8	8	27/6	—	5 1 10
Scottish Power	1	8	8	32/6	—	4 18 6
South London	1	8½	8½	27/6	+6d.	5 2 8
Urban Ordinary	1	7	7	25/-	—	... ...
Westminster Ordinary	1	8½	8½	27/-	—	5 3 8
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	23/9xd.	—	6 6 4
Yorkshire Elec.	1	8	8	38/-	—	4 5 4
Home Rails.						
Central London Ord. Assented	Stock	4	4	72	—	5 11 1
Metropolitan	,,	3	3	67	—½	4 9 7
do. District	,,	3½	4	79	—	5 1 3
Underground Electric	£1	1½	5	26/-	—1/-	3 17 0
do. do. Income	Bonds	6	6	125	—4	4 16 0
Telegraphs and Telephones.						
Anglo-Am. Tel. Pref.	Stock	6	6	104	—	5 15 5
do. Def.	,,	1½	1½	24¼	+⅛	6 9 0
Automatic Telephone	1	10	10	43/9xd.	+6d.	4 9 0
Eastern Extension	10	10	10	26	+¼	*3 17 0
Eastern Tel. Ord.	Stock	10	10	262½	+9½	*3 16 2
Globe Tel. and T. Ord.	10	10	10	25⅞xd.	+⅜	*3 17 8
do. do. Pref.	10	6	6	11xd.	—	5 7 10
Great Northern Tel.	10	20	20	38	—½	5 5 3
Indo-European	25	10	10	47½	+1	*5 5 3
Marconi	10/-	5	*10/12	8/12	+1/16	... ...
Marconi-Marine	1	8⅔	12½	56/-	—6d.	4 9 3
Oriental Telephone Ord.	1	12	12	57/6	—	*4 8 6
United R. Plate Tel.	5	8	8	9½	—⅜	*4 6 6
Western Telegraph	10	10	10	25¾xd.	+5/-	3 18 2

*Interim.

Home and Foreign Trams, &c.						
Anglo-Arg. Trams First Pref.	£ 5	5½	5½	8⅜	—	7 11 9
do. do. 2nd. Pref.	5	6	6	8½	—	8 11 6
do. do. 5% Deb.	Stock	5	5	78½	—	6 7 5
British Electric Traction Def. Ord.	,,	—	—	530	+10	... ...
do. do. Pref. Ord.	,,	8	7½	125	—	6 0 0
Brazil Traction	100	6	7	61½	—	2 17 6
Brit. Colombia Elec. Rly. Pcc.	Stock	5	5	90½	—	5 8 9
London & Sub. Trac. 5% Pref.	1	Nil	Nil	10/6	—	... ...
London United Tram Deb.	Stock	4	4	60½	—	6 12 3
Mexico Trams, 5% Bonds	—	5	5	78	—	6 8 2
Mexican Light Common	100	Nil	Nil	80½	—	... ...
do. 7% Pref.	100	Nil	7	81½	+4	8 11 10
do. 1st Bonds	—	5	5	76½	—2	6 10 9
Yorkshire (West Riding)	1	Nil	Nil	5/-	—	... ...
Manufacturing Companies.						
Babcock & Wilcox	1	18	15	71/3	+1/6	*4 4 3
British Aluminium Ord.	1	10	10	47/6xd.	+9d.	*4 4 3
British Elec. Transformer Pref.	1	7	7	18/-	—	7 15 0
British Insulated Ord.	1	15	15	4 5/16xd.	+9d.	3 11 9
Brush Ord.	1	10	10	28/9	—	6 19 3
Callenders	1	15	15	4½	+1/16	3 12 10
do 6½% Pref.	1	6½	6½	21¾	+1/8	5 4 0
Crompton Parkinson Pref Ord.	1	—	6	18/-	—	6 13 4
do. 8% Pref.	1	—	8	26/3xd.	+9d.	6 2 0
Edison-Swan	4/-	10	10	12/6	—	3 4 0
do. 5% Deb.	Stock	5	5	89½	—	5 11 9
Electric Construction	1	7½	7½	27/6	—	5 9 1
Enfield Cable Ord.	1	20	20	4¾	—	4 11 6
English Electric	1	Nil	Nil	7/-	—	... ...
do. do. Pref	1	3	Nil	10/-	—	... ...
Gen. Elec. Pref.	1	6½	6½	24/6	—	5 6 1
do. Ord.	1	7½	10	41/6	+6d.	4 16 5
Henley	25	25	5‡	+¼	4 6 2
do. 4½% Pref.	5	4½	4½	4¾	—	5 6 0
India-Rubber	1	Nil	Nil	13/9	—	... ...
Johnson & Phillips	1	12½	10	1⅝	—	5 6 8
Met.-Vickers Ord.	1	8	6	83/3	—	3 12 3
do. Pref.	2	8	8	2⅝	—	6 1 11
Siemens Ord.	1	7½	7½	1½	—	5 0 0
Telegraph Construction	19	10	10	24⅛	—	*4 18 6

*Dividends paid free of Income Tax.

†4% of which was tax free.

Production in Great Britain in 1924.

A Summary of the Number of Workers Employed, Output Values, and Mechanical Power Available.

THE Board of Trade has now published a summary of the preliminary reports based on the Census of Production in Great Britain in 1924. This census is the third of a series. The first was taken in 1907; the second related to 1912. Comparisons with the year 1912 cannot be made for the whole field of industry as the census for that year was not completed owing to the outbreak of the War. The fourth census is to be taken in 1929, and subsequent surveys will be made at intervals of five years.

The first section of the summary deals with the personnel of industry. The number of persons engaged in extractive (mining and quarrying) and manufacturing industries in 1924 was 7,612,800, of whom 5,746,100 were males and 1,866,700 were females, these figures excluding 44,000 out-workers. Comparative figures for 1907 show a total of 6,687,500 (excluding 97,000 out-workers) made up of 5,064,000 males and 1,623,500 females, an increase of 13.47 per cent. in the case of males and 14.99 per cent. in the case of females. The total number engaged in industry increased by 13.84 per cent. in the seventeen years, and it is estimated that over the same period the total number of persons gainfully employed increased by 13.87 per cent., reaching a figure of 20 million in 1924. Because the two series of figures are not prepared on strictly the same basis, however, it is calculated that both for males and for females the industrial undertakings covered by the census provided a somewhat greater proportion in 1924 than in 1907 of the total employed in all trades.

The aggregate figures indicate that over the entire range of industries covered no significant displacement of males by females occurred. A considerable proportion of the total increase, however, took place in the extractive industries where, owing to the nature of the work, males predominated in an exceptional degree, and in manufacturing industries alone, the proportion of females employed has increased from 28.2 per cent. to 29.4 per cent.

For the whole group of manufacturing industries there was an increase in the proportion of administrative and clerical staffs from 8 per cent. to 11.5 per cent. ascribed to the development of cost accountancy and more careful record keeping and the undertaking by manufacturers to a greater extent than before of merchanting work. The proportionately large increase in females engaged in this section, suggests that it is in clerical staffs mainly that the increases have occurred which result in the increased proportion of females in the aggregate. On the operative side, the proportion of females has increased. It is considered, however, that the increase is largely accounted for by the fact that some of the developments of the period since the first census have afforded particular scope for the utilisation of female labour, and consequently does not represent a serious displacement of males by females.

The summary deals in considerable detail with the changes in the numbers employed in the principal and other trades in the iron and steel group, the textile group, the clothing group and the food, drink and tobacco group. Considerable variation is shown in the proportion of administrative, technical and clerical staff employed in the various industries. In the engineering trades where this proportion is highest, 16.3 per cent. of all persons employed in 1924 consisted of such staff, the comparative figure for 1907 being 8.3 per cent. The figures for the whole group of manufacturing industries have already been given.

An important change has taken place in reference to the proportion of employés under and over 18 years of age. For male operatives the number under 18 years of age has fallen from 473,000 to 410,000, while for female operatives a small increase, from 389,000 to 396,000, is recorded.

An interesting table is given showing the changes between the first and third census in the relative importance of the different industries and groups of industries. Public utilities, with which the production in Government establishments has been grouped, show the largest proportional increase in relative importance, and the iron and steel group follows next in order. In the former case the extension of the work of local authorities and the increased use of electricity have had a notable influence on the growth shown, and in the latter the expansion of the motor car industry and the increasing need for electrical equipment, have together been of more importance than the decreased activity in the other industries in the group.

The second section of the summary deals with new values created in industry. It is stated that the totals recorded in the returns to the Census of Production office amounted to the following :—

Gross output : 1907, £1,698.2 million; 1924, £3,853.1 million.

Cost of materials and of work given out to be done on goods : 1907, £1,009.1 million; 1924, £2,155.6 million; net output : 1907, £689.1 million; 1924, £1,697.5 million.

As the output of some firms consists largely of goods serving as materials which other firms work up, the totals first given include considerable sums duplicated in the second set of totals. The last set of figures is clear of duplication, and represents the values resulting from the operations of industry out of which wages and salaries and all expenses such as rent, royalties, taxes, depreciation, sales expenses, and all similar charges have to be defrayed, as well as profits. Because of the rise in prices, direct comparison of the aggregates shown for net output in 1907 and in 1924 does not furnish a measure of the quantum of productive services rendered. The extent to which these totals are affected by the different ranges of prices at which the goods were disposed of, and the materials acquired is not known with any exactitude. The difficulties of price measurement over the period are great, and, moreover, it is not possible to determine the average change in quality in cases in which there has been no change in the description of goods. If, after excluding excise duties, the average rise in prices be taken as 100 per cent., the net output represented a larger mass of finished goods in 1924 than in 1907, the excess being about 19 per cent. compared with an increase of 13.8 per cent. in the numbers employed. Because of the relative unreliability of the price index, however, it does not seem possible to make a statement more definite than that a small quantitative increase of net output per head appears to be indicated.

A table is given in which the relative figures of net output in the aggregate and per person employed in different industrial groups are compared. This table, which is supplemented by a detailed analysis of the principal industrial groups, affords material for an instructive comparison between conditions in 1924 and those existing 17 years earlier.

Under the head " Employment in England and Wales and in Scotland " figures are given, showing for England and Wales and for Scotland separately, the principal particulars dealt with in the first two sections of the summary.

The third and final section of the survey deals with the power equipment of industry. The mechanical power available in the industries dealt with in the review showed a large increase between 1907 and 1924. The total horse-power of prime-movers, excluding those in electric supply stations, was 8,842,000 in 1907, 8,875,000 in 1912, and 11,037,000 in 1924. Of the total figure for 1924, 9,210,000 h.p. represented engine power regularly in use and 1,828,000 h.p. power in reserve or idle. In addition, there were shown in the returns for 1924 electric motors driven by purchased electricity, the total capacity of which amounted to 4,557,000 horse-power, including 627,000 horse-power reported as in reserve or idle. In connection with the first census corresponding particulars are not available, and although a figure of 941,000 horse-power was obtained in the 1912 census, this total was not exhaustive and may have been inaccurate in some degree. Making an allowance for exempted trades and possible inaccuracies, however, it would appear that the capacity of the electric motors driven by purchased electricity was in 1924 more than four times the horse-power of all such motors existing in 1912 in the entire field covered by the later inquiry.

In 1924, of the total electricity generated at or supplied by public generating stations, over 40 per cent. was returned as for power and manufacturing purposes, while about a quarter of the total was for purposes not distinguished. Leaving out of account the power equipment of the generating stations, except in so far as it was used to provide industrial power, the total mechanical power available to industry in 1907 was little, if at all, over 9,000,000 horse-power. In 1924 the total ordinarily in use was not less than 11,000,000 horse-power, to which should be added some part of a further 1,000,000 horse-power used in supplying electricity for purposes which may have been industrial, though not specifically so described. As the 9,000,000 includes power in reserve in 1907, the proportion of increase is greater than appears from the totals, as thus stated, and taking the figures in the mass they represent, an increase in the mechanical power per head amounting to not less than 7½ per cent. and possibly to as much as 40 per cent. Though this aspect of the figures appears to suggest a possibly only moderate advance in the provision of mechanical equipment in industry, there are other facts revealed by the records which show a change of remarkable extent in the manner of employing the power used.

It is not possible to make a direct comparison between 1907 and 1924 regarding the use of electric motors driven from dynamos and from purchased electricity, but a table is published, showing that the capacity of electric generators installed at the factories or works increased from 1,704,000 horse-power in 1907, to 2,701,000 in 1912, and 6,597,000 in 1924. The table shows clearly the smallness of the change between 1907 and 1924 in the total of reciprocating engines and the large increase of steam turbines and internal combustion engines. A second point of importance is the increase not only of the use of purchased electricity to provide motive power, but of the capacity of dynamos at the factories and works, the figures, excluding public supply stations, being 702,000 horse-power in 1907, 1,247,000 h.p. in 1912, and 2,564,000 h.p. in 1924 (including in the last year 717,000 horse-power in reserve). What proportion of this capacity was needed in 1907 or 1912 for purposes other-

than power is not known. In 1924 it is anticipated that the voluntary information received will throw light on this point.

The data show clearly that a large development of electrically-driven machinery has taken place and the increase of the power applied electrically considerably exceeds the decrease of the power applied mechanically. Since, however, the continuity of use of electrical and mechanical power may differ, and because of the uncertainty regarding the proportion of idle equipment in the earlier years, no precise comparison of the aggregate power equipment of 1907 and that of 1924, is possible. But a table is published showing the horse-power of prime-movers and generators in the main industrial groups in 1907 and 1924, and the figures given in this table are compared with the corresponding figures for 1912 where these are available.

A concluding table shows a comparison for 1912 and 1924 by groups of industries between the electric motors driven by purchased electricity and those driven by dynamos at the factories and works. The figures for 1912, as already indicated, are rather unreliable, but the absence of corresponding data for 1907 gives the defective data a value which they would not otherwise have. Including motors in reserve, the total capacity of all electric motors increased by 254 per cent. during the twelve years, and the figures suggest that a relatively larger dependence on purchased electricity for driving power for electric motors was manifested in 1924 than in 1912.

Electrical Imports of Chile.

Statistics for 1925 and 1926.

THE following figures, showing the values of the imports of electrical and allied goods into Chile in 1926 are taken from the recently published official trade returns. The total imports of electrical apparatus and material in 1926 were, roughly, £1,387,100 in value, of which United States imports were £931,000 and German £240,000, and British only £142 700 in value. The figures for 1925 are shown in the parallel column, but they are not on a comparable basis with the later values owing to the revalorisation of the peso, which in 1925 was worth 1s. 6d., and in 1926 only 6d.

	1925. Thous. Pesos.	1926. Thous. Pesos.
Insulators for telegraphs and telephones, &c.—		
Total	156	752
From United States	71	580
„ Great Britain	22	52
„ Germany	62	107
Wire, insulated or sheathed (covered)—		
Total	742	2,629
From Germany	419	617
„ United States	207	1,057
„ Belgium	12	47
„ Great Britain	49	548
Incandescent electric lamp bulbs—		
Total	759	2,216
From Germany	342	900
„ United States	160	576
„ Holland	156	314
„ Great Britain	33	121
Apparatus (various) for electric lighting—		
Total	570	3,282
From United States	202	2,333
„ Great Britain	91	263
„ Germany	239	642
Telephone apparatus—		
Total	641	1,771
From Great Britain	319	615
„ Germany	19	133
„ Belgium	10	306
„ United States	49	291
„ Sweden	231	345
Telegraph apparatus—		
Total	95	483
From Germany	9	112
„ Argentina	2	1
„ United States	47	256
„ Great Britain	36	83
Wireless apparatus—		
Total	490	803
From Great Britain	19	15
„ Germany	47	145
„ United States	353	571
Electric cables—		
Total	1,778	7,392
From Germany	300	546
„ United States	1,186	5,389
„ Great Britain	272	1,234
Electric bells and parts thereof—		
Total	11	27
From Germany	8	21
„ United States	1	5
„ Great Britain	1	—
Pipes and tubes, insulated for electrical purposes—		
Total	103	381
From Germany	86	118
„ United States	7	261
„ Great Britain	2	2
Carbons for electrical purposes—		
Total	44	133
From United States	7	17
„ Great Britain	29	59
„ Germany	7	55
Dynamos, motors and parts thereof—		
Total	2,082	14,496
From Germany	445	3,143
„ United States	874	9,982
„ Great Britain	744	1,127
„ France	23	19
Electric lamps (other than incandescent bulbs)—		
Total	137	575
From Germany	77	394
„ United States	45	177
„ France	10	22
„ Great Britain	1	11
„ Holland	—	5
Meters—		
Total	215	795
From Germany	71	327
„ United States	33	96
„ Great Britain	108	364
Cells and accumulators—		
Total	418	1,155
From Germany	100	134
„ United States	256	900
„ Great Britain	50	70
Posts for supporting electric wires and cables—		
Total	36	796
From United States	22	781
„ Great Britain	14	15
Electric fans—		
Total	46	171
From Germany	14	36
„ United States	24	73
Electrical machinery, apparatus and parts (unspecified)—		
Total	2,221	17,625
From United States	1,477	13,892
„ Germany	488	2,245
„ Great Britain	225	1,080

The British Industries Fair.

Space in the London section of the British Industries Fair, to be held at the White City from February 18th to March 1st, 1929, is being booked up more quickly than ever before, the total stand area reserved exceeding 230,000 sq. ft., as compared with 191,000 sq. ft. at the same time last year. The Empire Marketing Board's display will include Canada for the first time and the Canadian Government, in addition, has taken a whole new hall with 7,000 sq. ft. of stand space for a display by Canadian manufacturers. The large Machinery Hall, which has not been used before, is being taken in. This means an addition of 100,000 sq. ft.

The Fuel Conference.—II.

Proceedings at the Sectional Meeting of the World Power Conference held in London.

At the opening session of the Fuel Conference on Tuesday morning, September 25th, Lord Aberconway presided, and Section A, the broad subject of "The Coal Industry—Economic and General Considerations"—was discussed; a general report had been prepared by Mr. J. Roberts on the thirteen papers, which related mainly to the classification of coals, and the methods of utilising low-grade fuels, such as lignite. Classification was regarded as a matter of the first importance to both seller and buyer; it is being carried on in the United States by 13 committees, actively supported by the coal producers, and the organisation of the work was described in a paper by Mr. A. C. Fieldner. The difficulties met with in effecting the combustion of brown coal in Australia were described in a paper by the State Electricity Commission of Victoria; the large proportion of moisture present (50 per cent. in the Morweli deposits, and 64 per cent. at Yallourn), and the low heat value of the combustibles in the coal, combine to decrease the thermal efficiency and to necessitate enormous grate areas. After many experiments on a large scale, it has been found that mechanical "step" grates, in conjunction with drying shafts, give the best results. Low-temperature carbonisation, combined with pulverised fuel firing, carried out at the mine, has proved effective in the case of Korean brown coals, and the establishment of power stations at coal mines, feeding into a high-pressure network, is contemplated for the supply of electricity in the Korean peninsula. In view of the enormous quantities of lignite coals that are known to exist, the information contained in the papers on the subject of their utilisation is of great value.

Simultaneously, in another hall, Section E: The Oil Industry—Economic and General Considerations—was the subject under discussion, the chairman being Sir R W. Cohen. Mr. J. Kewley prepared the general report on the two papers that were submitted, which dealt mainly with the production and price of petroleum spirit.

Following this, under the same chairman, Section N: Internal Combustion Engines—was discussed; nine papers were submitted, and the general report was prepared by Messrs. J. Kewley, H. R. Ricardo, and O. Thornycroft. Three of the papers related to petrol engines, two to motor traction with heavy oils, two to experiments on Diesel engines, and two to fuel oils (one of these, by Mr. Harold Moore, was abstracted in our last issue). Interesting particulars were given by Mr. P. Yanouschevsky regarding two large Diesel-engine-driven locomotives on Russian railways, one of which, of 1,100 or 1,200 b.h.p., is fitted with electrical transmission, whilst the other is geared, with magnetic clutches. It was stated that the operating costs of these locomotives were about 76 per cent. of those of a steam locomotive of equal capacity.

In the afternoon Prof. J. W. Cobb, C.B.E., presided over the discussion on Section B: Sampling and Testing of Solid Fuels. Five papers were presented under this head, and the general report was prepared by Dr. A. Parker. One of the papers, of which an abstract appeared in our last issue, described the methods adopted in Austria for commercial and technical purposes, as distinct from special investigations. According to experience in Germany, in guarantee tests of steam-raising plant efficiencies should be stated in terms of the net calorific and not the gross calorific value of the fuel used, as, if the latter is taken as the basis, the results are materially affected by the moisture content of the fuel.

At the same time the discussion was proceeding on Section F: Composition, Classification, Preparation, Storage, and Handling of Liquid Fuels, under the chairmanship of Sir Thomas Holland, F.R.S. No fewer than 12 papers were reported on by Dr. A. E. Dunstan, under this head; most of them dealt with the preparation and characteristics of motor spirit, and allied subjects, but one, by Mr. I. Lubbock, related to the storage, handling, and transmission of liquid fuels, and gave valuable information on these points.

On Wednesday, September 26th, Section C: Coal Treatment, and Section D: Storage and Handling of Solid Fuels, were discussed, with Prof. R. V. Wheeler in the chair, whilst in another hall Section R: Peat was considered, Dr. C. H. Lander, C.B.E., presiding, and Section S: Power Alcohol, with Dr F. S. Sinnatt in the chair.

The reporter for Sections C and D was Dr. W. R. Chapman, and eleven papers were submitted. They related mainly to methods of cleaning and drying coal at collieries, and storing it at certain places abroad, but one, by Mr. R. K. Stockwell, on the storage and handling of solid fuels by the user, was of interest to power-station engineers, describing the various types of machinery employed and the best methods of storing coal. Extracts from this paper will be given later.

Under Section R: Peat, six papers were submitted, and the general report was prepared by Mr. T. C. Finlayson. Three of the papers dealt with Russian practice, two with the methods of treatment adopted in Germany and Latvia, and one with experiments in Great Britain. The trouble with peat is that it is 90 per cent. water, and the drying problem is particularly complex, the water being intimately associated with the structure of the solid matter. Some new inventions to cope with the peculiarities of peat were described in the papers. Messrs. N. Testrup and T. Gram, working at Dumfries, Scotland, after trying various processes arrived at a method of cutting peat on the bog in thin layers, drying it to 80 per cent., and then passing it (mixed with a portion of previously dried peat) through a quadruple-effect tubular drier, from which it emerges as a dry powder. The drier is heated with steam or hot water, the heat being utilised four times at successively lower temperatures, so that it is possible to attain a satisfactory thermal efficiency. The authors point out that where steam turbines are installed, steam taken from the turbines at 65 deg. C. can be used economically to de-water all the peat required as fuel from 80 to 10 per cent. water content, the drier practically taking the place of a cooling tower. With this system the cost of the fuel (exclusive of royalties) is from 2s. 6d. to 3s. per ton. Estimates were given for the case of a power plant of 30,000 kW capacity.

The particulars given with regard to Russian electricity works using air-dried peat were interesting; a hopper-feed chain-grate stoker has been devised by Prof. Makarieff, on which the design of a number of stations has been based. Other mechanical improvements were also described in the papers by the Scientific Experimental Institute of Peat (Russia), and details of the Shatura (48,000 kW) peat-power station and other large installations were given. The conclusion is that important progress has been made during the past few years, especially towards electric power generation from peat fuel.

On Wednesday afternoon Section G: The Carbonisation Industry—Economic and General Considerations—alone was in session, with Sir David Milne Watson, D.L., in the chair. Twelve papers were summarised by the general reporter, Mr. F. S. Townend: most of them related to coke production and allied matters, including the utilisation of coke-oven gas by the gas supply

industry Thursday morning was devoted to Section H: Gaseous Fuels, with Mr. J. Terrace in the chair; seventeen papers were submitted, and Mr. T. C. Finlayson was the general reporter. In the afternoon official visits were paid to the Port of London and the Rothampstead Experimental Station.

The Economic Utilisation of Fuel in the Production of Electricity.

By R. P. SLOAN, C.B.E.

(Abstract of Paper presented to the Fuel Conference.)

COMPARED with the total quantity of fuel used in Great Britain for all purposes, the quantity used for the public supply of electricity is relatively small, and owing to improved methods it is likely that it will increase only slowly

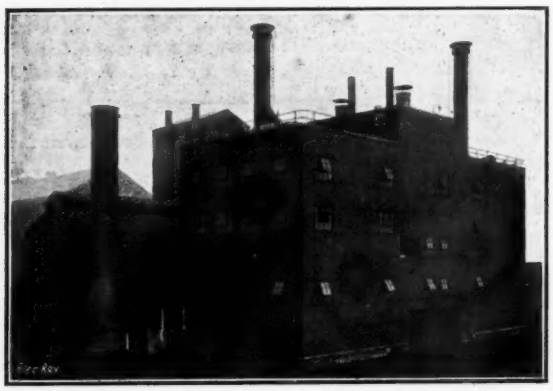


Fig. 1.—Distillation Plant Boiler House.

during the next three or four years. In 1926-7 the amount of coal consumed per unit generated was 2.43 lb. for all steam-driven stations belonging to authorised undertakers in Great Britain, but in large generating stations the coal consumed per unit generated will not exceed 1½ lb.; consequently, as the proportion of electricity produced at such stations increases and the proportion obtained from small stations is reduced, a much greater output will be obtained from the same amount of coal. Another factor likely to retard the increase in the quantity of coal required by the electricity supply industry will be a more complete use of such sources of waste energy as are available. In the case of one of the power companies operating in this country, the average coal consumption per total unit generated (by means of coal and waste energy) last year was 21 per cent. less than it would have been if generated by means of coal only. In this connection, however, it must be remembered that steady efforts are being made in all directions to prevent waste in manufacture. Consequently, as time proceeds, the amount of waste heat available is likely to decrease, and it will be necessary to depend more and more on direct production. It follows that the closest attention to economical working will be increasingly necessary. It is of considerable interest to arrive at figures showing the relative importance of the cost of coal as it affects the cost of electricity for various services.

The following are typical figures setting out the proportion which the cost of coal bears to the other charges involved in providing a supply of electricity from a public supply system:—

(1) Lighting of small houses: Coal, at 20s. per ton, .32d. per unit; other payments, including interest, dividends and reserve, 6.68d. per unit; total, 7.00d. per unit. Percentage of coal cost to total costs, 4.6 per cent.

(2) Average house and shop lighting: Coal, .32d. per unit; other payments, 4.68d. per unit; total, 5.00d. per unit. Percentage of coal cost to total costs, 6.4 per cent.

(3) Supply for power purposes to the average small power customer: Coal, .27d. per unit; other payments, 1.23d. per unit; total, 1.50d. per unit. Percentage of coal cost of total costs, 18 per cent.

(4) Supply for power purposes to large power customers: Coal, .19d. per unit; other payments, .61d. per unit; total, .80d. per unit. Percentage of coal to total costs, 24 per cent.

(5) Supply to electrochemical, or similar works: Coal, .17d. per unit; other payments, .23d. per unit; total, .40d. per unit. Percentage of coal cost to total costs, 43 per cent.

(6) Supply to very large power consumers situated near power station: Coal, at 20s. per ton, .16d. per unit; other payments, .19d. per unit; total, .35d. per unit. Percentage of coal cost to total costs, 46 per cent.

It is clear from the above that with the exception of the last two examples, the influence of the cost of fuel on the total cost of the supply of electricity is relatively small. As the cost of electricity is reduced there will be a more general and extensive use of electricity for domestic purposes, which will result in the cost of fuel representing as much as 20 per cent. per unit sold:—

Supply for household use, assuming the general use of electricity for lighting, heating, cooking, &c.: Coal, .27d. per unit; other payments, .98d. per unit; total, 1.25d. per unit. Percentage of coal cost to total costs, 21.5 per cent.

It is obvious that, to produce electricity at the lowest cost, a just proportion between capital and other charges and the cost of fuel must be attained, so that the result will be a minimum. This consideration may, in the future, lead to a combination on the one hand of very large steam-operated stations designed to work at a maximum economy, coupled with secondary stations, possibly using oil fuel, designed and situated so as to involve the lowest capital cost.

Economy in fuel consumption at large steam stations must be sought in avoiding waste of heat at every vulnerable point. The economy to be gained by increasing the steam pressure is relatively small. It would be a considerable benefit if medium high pressure could be standardised at, say, 350 and 500 or 600 lb. per sq. in., and the employment of intermediate figures avoided, as they merely result in increasing the cost of the plant.

The use of higher temperatures depends on the ability of the metallurgist to produce metals capable of working under the severe conditions that must arise when the temperature exceeds 700-800 deg. F. There are instances where cheap fuel is available which admits of its being burnt on the necessary large scale in pulverised form to far better advantage, as compared with the raw form on ordinary stokers. Pulverised fuel plants have been put up solely to take advantage of such local conditions. The difficulty, however, is that in general the quantities of such cheap fuel are relatively limited, and that, as soon as a free demand arises the price tends to rise and approximate the value of other fuels. The advantage to be attained under these circumstances, therefore, is often short-lived.

In the processes carried out by large consumers of electrical energy it frequently happens that steam heating forms an important part, and that back-pressure turbines may be used to advantage, and enable electricity to be produced at a much lower cost than by the adoption of any alternative method.

Generally, economies in the use of fuel for the production of electricity cannot be considered apart from the question of the cost of securing such economies. With the extension of the interconnecting trunk mains throughout the country, the economical working of the larger stations must steadily improve, as the increase of load factor at which they will be operated will make the economy in coal consumption of greater importance. The improvement in load factor must be secured mainly by the use of other stations to supply the peak load, these stations being designed to keep down the capital expenditure rather than to obtain the maximum fuel economy.

Improvements in design of the main power stations, therefore, combined with the careful co-ordination of fuel-using

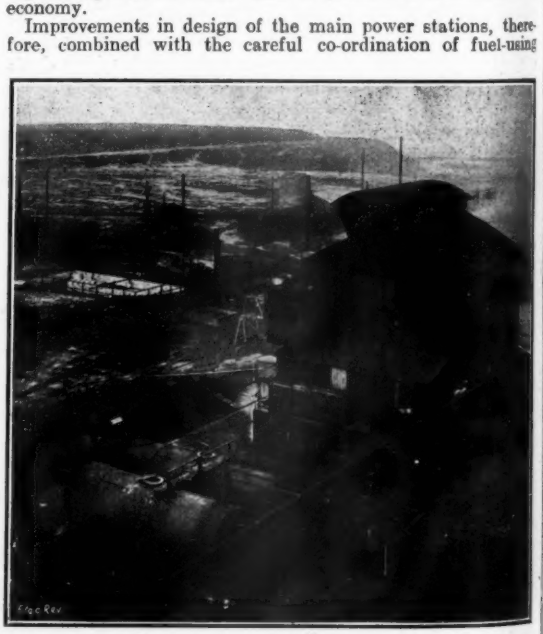


Fig. 2.—By-product Plant.

plants in any manufacturing district and using the electric system as a link to make such co-ordination possible, are the directions in which the greatest success in fuel economy is likely to be found.

Another direction in which economies in the use of fuel may be looked for lies in the treatment of coal in order to obtain the by-products and the utilisation of the resultant semi-coke for the purpose of steam raising. Under present conditions, it is not likely that any large direct economies

may result, but the careful study and extensive experiments that are being made in this direction may be of the greatest use in the future. Any distillation process involves a waste of the fuel treated to an amount necessary to effect the distillation. There remain for sale, after distillation, coke, gas, ammonia, and tar, and from the latter can be produced oil, motor spirit, the raw material for dye manufacture, and other products.

The commercial success of the process will depend on finding

Fig. 3.—Coal Preheaters on Retorts
(cover removed to show chain grate).

the best market for the sale of these products, as the power station can buy only the coke and gas and pay for them at their heat value. Under present conditions and at present prices, no important commercial economies have so far been obtained. This is indicated by the results achieved from the coal-distillation plant at the Dunston Power Station of the Newcastle-upon-Tyne Electric Supply Co., Ltd.

There would be certain important consequential advantages if coal distillation were widely adopted:—

(1) To the extent to which semi-coke is used for steam raising, some 30 to 33 per cent. more coal must be mined to produce a given amount of electricity.
(2) Great Britain is largely dependent upon foreign supplies for the more important products of coal distillation, namely, motor spirit and paraffin.

As to the first, it is evident that in burning coal in its raw state full advantage is not taken of its potentialities. We are therefore not utilising in the most economical way what is possibly our most valuable raw material, and one which, from its nature and origin, is commonly and rightly referred to as a "wasting asset." As to the second, the importance of becoming self-supporting, in however small a measure, in the matter of fuel for necessary transport services, is self-evident.

From 1 ton of coal—costing, say, 12s., and containing, say, 11,500 B.th.u. per lb.—a number of derivatives can be obtained by distillation of the volatile constituent, the value of which is 10s. 6d., or 87 per cent. of the cash value of the raw coal.

Coal Distillation Plant at the Dunston Power Station.

Value of derivatives from 1 ton of coal (2,240 lb.).—

(*a*) From distillation of volatile constituent:

	s.	d.
1.0 gall. of motor spirit at 1s. 2d. per gall. ...	1	2.00
1.0 gall. of white spirit at 1s. 1d. per gall. ...	1	1.00
1.43 galls. of crude paraffin at 3¾d. per gall. ...		5.36
6.88 galls. of creosote at 8¼d. per gall.	4	8.76
5.0 galls. of pitch at 5.38d. per gall.	2	2.90
0.507 gall. of cresylic acid at 1s. 8d. per gall. ...		10.14
	10	6.16
(*b*) Semi-coke and gas having a calorific value equal to 0.76 ton of raw coal at 12s. per ton	9	1.44

Average prices ruling in 1st quarter, 1928.

In other words, if the cash value of the raw coal is taken as 100, after distillation, two products are obtained, (*a*) derivatives with a cash value of 87, and (*b*) semi-coke with a cash value, on a thermal basis, of 76; or, taken together, a 63 per cent. increase in the cash value. The heat value of the coal which is not available for purposes of steam generation is only 2,760 B.th.u. per 1 lb. of coal distilled, or no more than 24 per cent. of the heat value of the raw coal (*i.e.*, 12 per cent. heat value of oils and 12 per cent. heat consumed in process).

The combination of coal-distilling plant and steam-raising plant involves submitting the coal to two processes. In the first, it requires heating to a carefully graduated temperature so as to drive off most of the volatile matter to form the fluid distillate. In the second the residue—the solid distillate—has to be delivered to the boiler furnace and burned therein, substantially as a smokeless fuel in the form of coke.

To evolve some practical and convenient means of applying these two separate processes was the first problem which those associated with the Newcastle-upon-Tyne Electric Supply Co. set themselves to solve. A number of distinct and rather intricate problems had to be solved before any degree of success could be attained. It was early determined to rule out all schemes involving the transfer of heat to the coal through some pipe or outer covering in favour of applying the heat directly to the coal, the object being to overcome the difficulty which arises from the fact that coal is a very poor conductor of heat. Frequent experiments and alterations were made necessary by the absence of previous experience; the difficulties were considerable.

At the Dunston Power Station of the Newcastle-upon-Tyne Electric Supply Co. the plant is situated in the boiler house, and the coke is taken direct from the retorts to the boiler furnace. Capital cost has thereby been reduced, and the coke leaving the retorts is delivered continuously to the stoker hoppers, and part of its sensible heat is returned to the retorts and the balance to the boiler plant.

The distillation plant consists of four retorts and four boilers. The coal is screened, the fines being delivered through a pulveriser to one of the boilers, while the screened coal is delivered to the retorts. The boiler plant operating in conjunction with the retorts consists of three Babcock & Wilcox coke-fired boilers, two of which are built together and have a combined evaporative capacity of 18,000 lb. of steam per hour, and one of 30,000 lb. of steam per hour. Each boiler forming the 18,000-lb. unit has its own retort, which is capable of distilling 20 tons of coal per day. The 30,000-lb. boiler has two retorts, the combined capacity of which is 60 tons per day. The complete plant is therefore capable of distilling

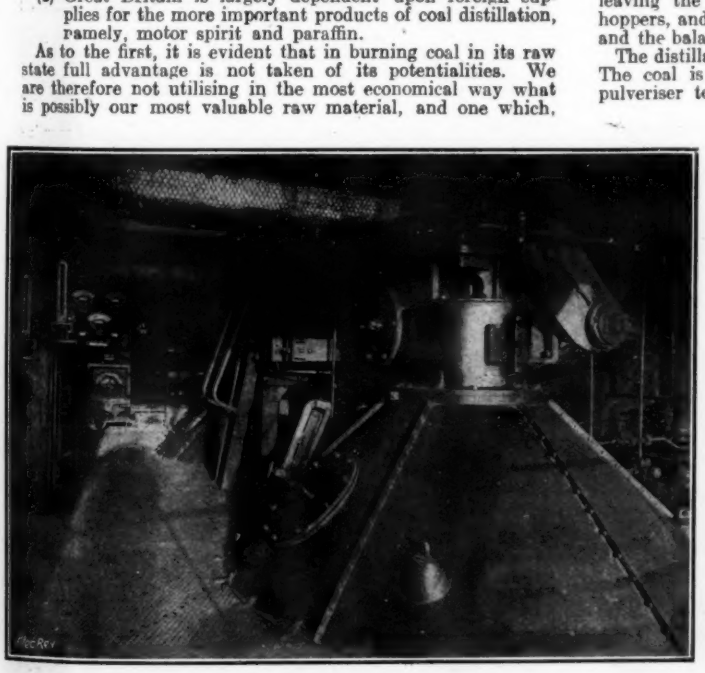


Fig. 4.—Upper Part of Retort, with Coal Feeding and Spreading Gear; Control Instruments on the Left.

Fig. 5.—Bottom of Retorts, with Coke-fed Chain-grate Stokers.

about 100 tons of coal per day, and the resultant coke is available for firing the three boilers. The pulverised-fuel boiler—or fourth boiler—has also an evaporative capacity of 30,000 lb. of steam per hour. This boiler is eminently suited for dealing with peak loads, and thus enables a steady load to be maintained on the coke-fired boilers, so that the throughput of the retorts is kept constant.

The condensing and gas-washing plant for the recovery of crude tar and gas spirit is located outside the boiler house, as also is the spirit-recovery and tar-refining plant.

Northumberland "rough small" coal is used, and on delivery to the station the fines are separated and delivered by conveyors to the drying and pulverising plant which serves the pulverised-fuel boiler. The larger coal (¼ in. upwards) is stored in two bunkers of 35 tons (2,240 lb.) capacity which feed the retorts. Before delivery to the retorts the coal is fed to pre-heaters which are in the form of chain-grate stokers housed in a brick setting, wherein the coal is heated to a predetermined temperature by waste flue gases. The object of the pre-heater is to prevent subsequent sticking of the charge in the retort, and to perform part of the heating of the coal by the use of waste heat, with consequent economy.

The coal takes about 15 minutes to pass through the pre-heater, from which it is delivered continuously to the retort by means of a screw conveyor through a rotary valve, which also acts as a seal. In the retort the coal is spread and levelled automatically.

The distilling medium consists of a mixture of steam and the products of combustion from the burning of coke-oven gas in a small combustion chamber arranged under each retort.

Low-pressure steam at approximately atmospheric pressure, part of which is obtained by quenching the hot semi-coke in its passage to the stoker hoppers, is used for regulating the temperature and composition of the distilling gases, which enter the retort through an annular space, giving an even distribution of heat to the coal. The passage of the coal through the retort occupies about three hours, the extraction of the coke being effected by means of a series of hydraulically-operated toothed rollers which form the bottom of the retort. The hot coke is discharged continuously through coke breakers to a rotary sealing valve, and thence by a screw conveyor to the stoker hopper.

Meanwhile the distilling gases and the volatile constituents of the coal are drawn off by a gas exhauster and passed through a filter which cleans the gas before it enters a water-tube condenser in which the tar vapours are condensed, the crude tar being pumped direct to storage tanks. The gas is then washed with oil produced in the process for recovery of crude spirit, and is conveyed to burners at the back of the boiler. Its calorific value as fired under the boilers is about 80 B.th.u. per cu. ft.

The spirit-recovery and refining plant is designed on standard lines. The total cost of operation and maintenance amounts approximately to 4s. 8d. per ton of coal distilled. This figure is not an estimate, but the outcome of actual experience extending over the past three years.

Three shifts are worked during each twenty-four hours. The staff required per shift to operate the plant as it exists at present includes: Two boiler firemen; two retort attendants; one distillation-plant attendant; one ash man; two coal men and one pitch man, required on one shift only.

A plant four times the capacity of the existing Dunston installation could be operated with approximately 40 per cent. increase in labour cost and without any appreciable increase in the cost of supervision, thereby considerably reducing the operation cost per ton of coal distilled.

As regards the products of the process, the coke and surplus gas are fed direct to the boiler furnaces. The other products are refined and stored in tanks with the exception of the pitch, which is discharged into moulds for disposal. These products have found a ready market locally.

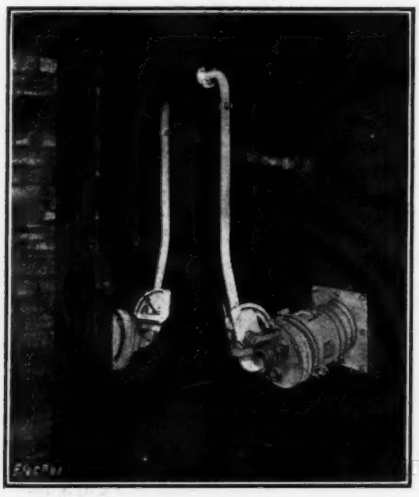


Fig. 6.—Gas Burners on Retort Combustion Chambers.

Fig. 7.—Hydraulic Operating Gear on Coke Extractors.

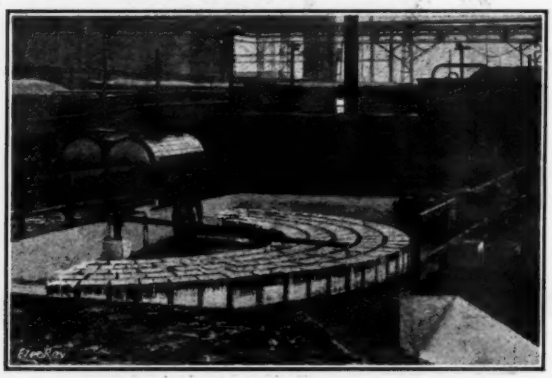


Fig. 8.—Tar Stills, and Pitch Block Moulding Plant.

Section A: The Coal Industry.—Economic and General Considerations.

This Section met under the chairmanship of Lord Aberconway on Tuesday, September 25th, when sixteen papers were presented and discussed.

The CHAIRMAN, in opening the meeting, deplored the fact that a nation so intelligent as our own should not see the necessity for a complete organisation such as those which were pointing the way in other countries. The classification of coal was of the utmost importance.

Mr. W. THORNEYCROFT (vice-chairman) said that whether scientific classification could be used in commercial practice had still to be determined. It would not be disputed that the producer whose costs permitted the delivery of a suitable variety of coal to the place of consumption at the lowest price would command the market, and it was difficult to see how any specification or classification of that variety would alter this.

Mr. E. G. SAHLIN (Consul-General, Sweden) said that Sweden had gone into the question of classification to such an extent that some of the larger consumers of coal there bought under guarantees as to the heat value and ash and moisture contents. The expression "large steam coal" was quite an insufficient basis for judging the properties or value of that coal. It had often been found that so-called large steam coal contained up to 30 or 40 per cent. of small coal which necessarily affected the quality. The Swedish delegation desired to put before the Conference the following resolution:—

"Whereas it appears desirable that an International nomenclature for the classification of coal with regard to its properties be adopted, and that a uniform system for the determination of the fundamental properties of coal be established, it is resolved that the International Executive Committee of the World Power Conference be requested to take suitable steps to that end."

The resolution was put to the vote, and carried.

The National Radio Exhibition.—II.

Some Impressions of the Show, and brief Details of the Newer Apparatus on View.

General Electric Co., Ltd.

THE company's new season's programme has involved the scrapping of some receivers altogether and the drastic alteration of the specifications and prices of others. The design of new sets has been influenced by two considerations, *i.e.*, the proposed regional broadcasting scheme, and screen-grid valves. There may ultimately be five stations

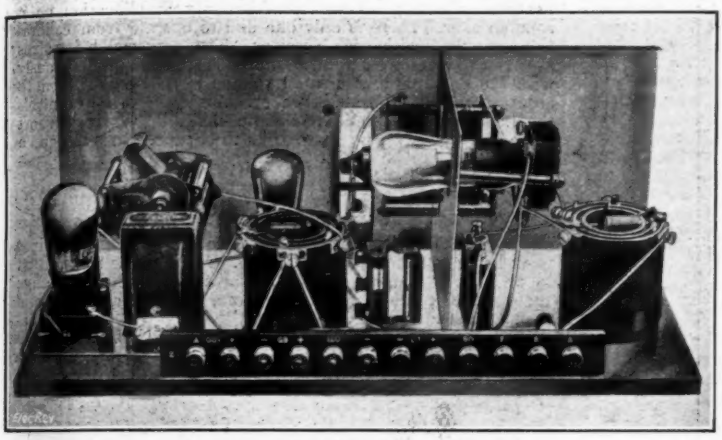


Fig. 1.—"Osram Music Magnet."

transmitting on two wave-lengths, thus making 10 in all, the power being between 25 and 50 kW. It is hoped that they will provide generally the much-discussed alternative programmes; in fact, it is confidently predicted there will be no fewer than six programmes, one and the same programme being transmitted from each station on one wave-length, and each other wave-length transmitting a different programme. The stations will in all probability operate on wave-lengths of between 200 and 550 metres, which will (according to the company) practically prevent the reception of foreign stations excepting with sets of good selectivity. Thus the scheme will create the necessity for more selective sets than those now on the market; will scrap practically all sets made during the past four years (except super-selective receivers) for other than purely local reception; and it will make possible the reception of several stations on a 4-valve frame aerial set. It is not anticipated, however, that the regional scheme will mature for at least another three years, but, none the less, its possibilities have been considered in evolving the new "Gecophone" receiving sets. The use of "Osram" screen-grid valves has meant fewer valves to give good quality

Fig. 2.—Langham Radio-gramophone Set.

reception and selectivity, since three tuned circuits are used. The "Victor" 3-valve model is extremely compact, in a black crystalline-finished metal case, and has three wave ranges operated by a switch covering approximately 200 2000 metres; the grid-bias current is taken from the h.t. battery.

The "All-Electric Three" set is suitable for working off 200/260-V, 50-cycle a.c. mains, three tappings being provided on the primary of the transformer for various voltage bands; the loud speaker is fed through a filter circuit.

The 4-valve model incorporates two h.f. stages of screen-grid valves, an arrangement which gives high sensitivity and ensures long-distance reception. The absence of any reaction and the use of a super-power valve guarantee reproduction. Ganged condensers render the operation of the set simple, particularly as a frame aerial is utilised.

The 6-valve stabilised model tuning is carried out by means of three slow-motion variable condensers, giving two tuning-ranges, for high and low wave-lengths, controlled by a novel push button. Among the new accessories, the a.c. h.t. power unit, employing an Osram U 5 full-wave rectifying valve, is suitable for all voltages between 200/260 (50 cycles); it has an output of 50 mA, a maximum voltage of 180 V, and two variable and one fixed output tappings. No skilled knowledge whatever is needed to build the "Osram Music Magnet" set, which is illustrated in fig. 1; no drilling or soldering is required; a screen-grid h.f. valve is used, of course.

Ferranti, Ltd.

New products of this company include several additional types of transformers and radio meters. The valve tester is a single instrument with a multi-way switch and 4-pin plug suitable for fitting in a standard valve socket, the top of the plug being so arranged that a valve may be inserted in it. This instrument will therefore enable a valve to be tested for emission, h.t. and l.t. voltage, whilst it is in position in a receiver, the various tests being made merely by rotating the switch; the resistance of the instrument is so high that even should a high voltage be applied to a low-voltage range no damage will result. Additional connectors enable the instrument to be used for ordinary testing purposes under which circumstances it has two ranges of 0/10 and 0/100 mA, and three ranges of 0/10/100/300 volts, 1,000 ohms per volt. A refinement is the arrangement of the switch so that if the l.t. voltage happens to be opposite to the normal reading, a movement of the switch will reverse it.

A series of moving-coil instruments of standard design specially arranged in conjunction with a thermo-couple

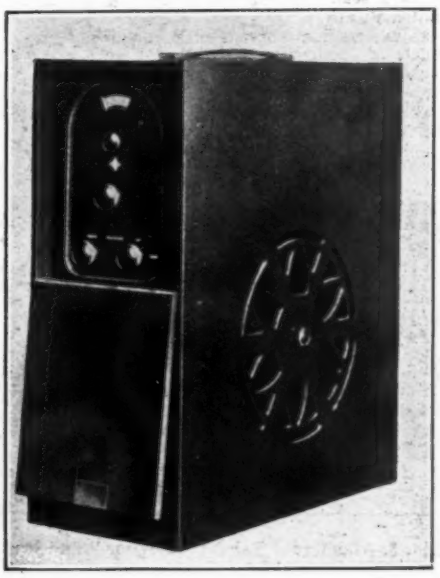


Fig. 3.—B.R.C. Screened Five Portable Receiver.

mounted in a vacuum tube are available as voltmeters, ammeters and milliammeters for a.c. and d.c. circuits, and will also read accurately in high-frequency circuits incorporating metal rectifiers. Ammeters, voltmeters, and milli-ammeters mainly intended for use in a.c. circuits (not on

high-frequency circuits) may be used in direct-current circuits, but are not recommended for that purpose. They represent an entirely new departure, and are said to be more reliable than similar instruments which depend upon valve rectifiers for their accuracy.

Langham Radio Co.

One of the several interesting items on this stand was a 5-valve portable receiver (fig. 2) combined with an electrically

Fig. 4.—" Electramonic " Home Combined Model.

reproducing gramophone. This leather-cased model is sold with a canvas cover having pockets for records and a turntable; the volume from the gramophone may be varied within wide limits. Langham set owners will be glad to know that their instruments can be modified and fitted with a gramo-

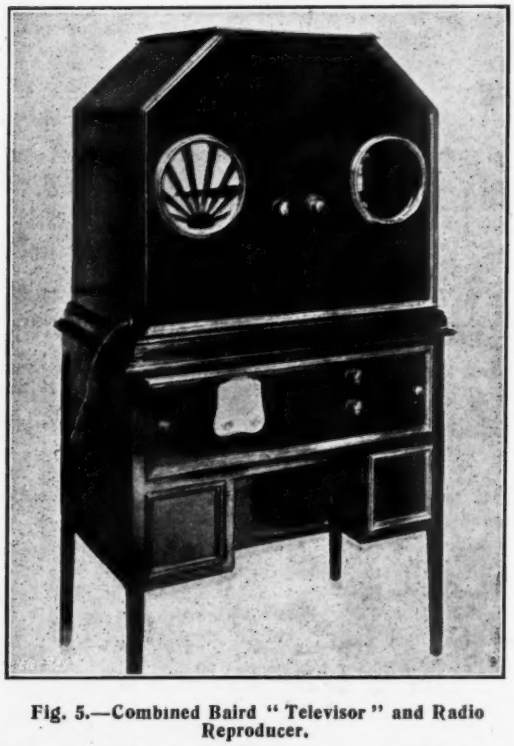


Fig. 5.—Combined Baird " Televisor " and Radio Reproducer.

phone. The 1929 model " Transatlantic " portable receiver incorporates the recently patented wave-length changing device which enables this operation to be carried out mechanically instead of by the usual electrical method. Lightness has been obtained by the use of cellulose finished burr walnut aluminium panels, which are unbreakable.

Another instrument is encased in a well-finished cabinet in which a turntable, enabling the machine to turn to any direction, is concealed in the base.

Electramonic Co., Ltd.

Being a combination gramophone and wireless set of good workmanship, this instrument is available in four main classes: the " Home Model " for reproducing gramophone records only; the " Home Combined Model," as fig. 4 shows, is for record and broadcast radio reproduction; whilst the " Club Combined Model " and the " Theatre Model " are similar but larger machines. The last-named has two turntables, so that at the end of one the other can be switched in, making reproduction continuous. The set includes five valves, and the smaller patterns can be battery operated.

British Radio Corporation, Ltd.

In the 5-valve portable set, shown in fig. 3, no damping is used, no reaction, just pure radio-frequency amplification and then natural low-frequency amplification on a cone speaker. There is only one dial to operate from calibrations supplied with each receiver. Two screened h.f. valves are incorporated; each h.f. circuit is tuned simultaneously with the aerial circuit, a small volume control being fitted to adjust output to the loud-speaker. A simple switch controls the l.t. and h.t. supplies, and also changes over from short wave to long wave, no extra coils to change. In addition, a gramophone can be operated through the amplifier and loud-speaker by a simple jack plug.

Baird Television Development Co., Ltd.

Several " Televisor " receivers were on view, the cabinet work being of handsome appearance. Television is transmitted in an exactly similar manner to broadcast radio-telephony; the observer tunes in an audible note, which is amplified and then passed to the " Televisor." Model " A " is designed for connection to any ordinary wireless set that is capable of operating a loud-speaker. A 6-volt accumulator

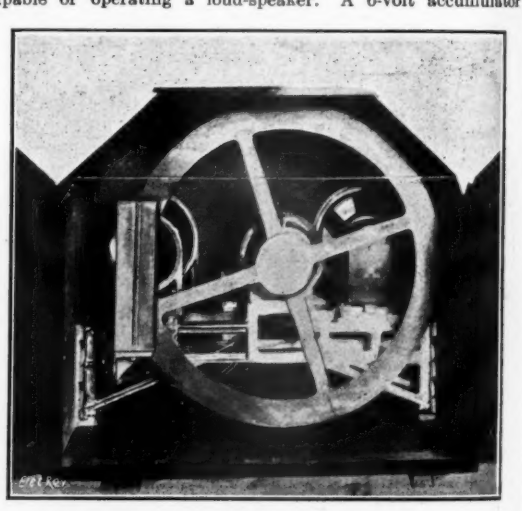


Fig. 6.—Rear View of " Televisor."

feeds a little motor which drives the mechanism, and a minimum high-tension voltage of 350 V is required, which may be derived from either a.c. mains or h.p. batteries. When tuning the signals in the observer first sees on the screen of the instrument a swirling mass of reddish light; as the synchronising control knob is turned slowly, increasing the speed of the motor, the light resolves itself into a series of images moving rapidly downwards across the screen. As the motor approaches the correct speed the images tend to become stationary, and finally come to rest when synchronism is reached. Should the image, however, not be central in its frame, the phasing control is operated to push the image up or down as required. Model " B," in which a moving-coil speaker is incorporated, gives a larger size of image, and needs a 12-volt accumulator to drive the motor. It will function in conjunction with any ordinary wireless set that is capable of driving the coil speaker and is capable of being used for the simultaneous reception of vision, music, song, speech, &c. Both telephony and vision are picked up on the same aerial, without interference with each other, as two separate wave-lengths are used. Model " C " comprises a dual television and radio set combined with a coil speaker, forming a self-contained cabinet (fig. 5) of handsome appearance. The " Televisor " has two high-frequency, one detector, and three low-frequency valves; the radio set also utilises two h.f., one detector, and three l.f. valves. For this large set a rotary transformer is provided, which may be run off the mains or an l.p. accumulator, for supplying all the high tension required by the combined apparatus. The synchronism of the voice with movement of the lips, &c., is very good. The head only of the person televised is shown on the screen, but the results obtained have certainly been materially improved since we first saw the system demonstrated.

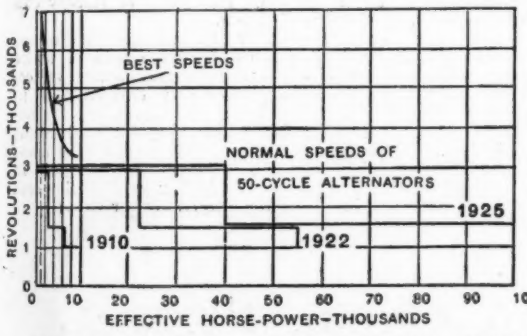
Recent Progress in the Construction of Large Thermal Power Stations.

Abstract of a Report presented to the Conference of Producers and Distributors, Paris.

By M. ORENGO, Director, Energie Electrique du Nord de la France.

THERE is a certain hesitation on the part of French power producers regarding the increasing of thermal efficiency by increase of steam pressures. No French station has yet reduced the heat utilised to the figures obtained in some stations in other countries of 3,600 to 4,000 calories per kW. The first question must of necessity be security, which, in turn, tends to postulate simplicity; economy, however important, must take second place, and must be based on all-round balance. A minimum coal consumption does not necessarily mean lowest generating costs; continuity of service is an important factor. The more difficult the conditions of operation, the more important it is to make sure that the improvements in efficiency by the adoption of the most up-to-date machines or cycles are not obtained at the expense of reliability, or at too high a capital cost. There are two lines of progress: (1) The improvement of functional efficiency; (2) the improvement of the heat cycle.

Regarding the former, one movement has been towards the concentration of power in large stations; the arrangements of the connecting network must, however, be favourable to this policy. While turbines of 25,000, 30,000 and 40,000 kW at 1,500 r.p.m. only require a small number of turbine wheels of large diameter and a single chamber, and have given satisfaction after necessary adjustment, yet the steam



Curve 1 (type 19 u), 256 lb. sq. in., 662 deg. F; Curve 2 (type 1927), 284 lb./sq. in., 707 deg. F.; Curve 3 (type 1927), 426 lb./sq. in., 757 deg. F.

Fig. 1.

consumptions have materially exceeded those anticipated; and whereas large single-cylinder machines are advantageous as regards first cost, yet the higher efficiency and greater security of high-speed multi-cylinder machines justifies the extra expense. The radial depth of blading at the condenser ends and the high peripheral velocity with single-cylinder machines make security more difficult to obtain; the functional efficiency of turbines has been increased from 76 and 78 per cent. for 1,500 r.p.m. to 84 and 86 per cent. for 3,000 r.p.m. Fig. 1 shows the increase in turbine speeds during recent years. Pulverised-fuel firing is rapidly increasing, but up to now boiler makers have not considered it necessary to find the type of boiler most suited to it. There has been in practice during the last six years very little improvement in boiler operating efficiency. An evaporation of 7.2 to 8.2 lb. per sq. ft. of heating surface seems to remain the limit compatible with the preservation of the plant. It is not enough to increase the exchange of heat between the flue gas and metal by increasing the direct heating surfaces; the speed of the gas must be increased and tube wings introduced; but the temperature of the metal must not be dangerously increased, and this means the highest possible velocity of the water to be heated, a matter in which no particularly efficient arrangement has been made, at any rate as regards French boilers. The principal functional improvements have been due to the use of high-speed multi-cylinder turbines. Efforts have been made to increase the steam temperature and pressure. The results obtained with pressures of 711 lb. per sq. in. at Langerbrugge have been confirmed by installations in America, England, and Germany. In France, in 1927, it was decided to put up important stations with pressures not over 569 lb. per sq. in. and 797 deg. F. However undeniable the theoretical advantages obtainable with high pressures and temperatures are, they do not appear to be always as great as those hoped for.

With increasing steam pressure and constant temperature the number of calories per kilogram of steam diminishes more and more. The calories utilisable in a turbine, and, therefore, the thermal efficiency, increase rapidly between 284 and 568 lb. per sq. in., and diminish between 1,422 lb. per sq. in. and the critical pressure. The benefits theoretically obtainable do not follow increases of pressure unless the temperature is also raised; however, the increase of temperature is always advantageous. The theoretical efficiency of a turbine supplied at 497 lb. per sq. in and 752 deg. F. is about 36 per cent. The temperature at admission is limited by the fact that the steam arriving at the condenser must be wet, or at least saturated, at all loads, and by the rapid diminution of the resistance of metals at high temperatures. It does not appear, therefore, to be wise at present to exceed 752 deg. F., and unless the steam is reheated, which involves complications, the pressure should not exceed about 570 lb. per sq. in.

For a given admission temperature the increase in pressure is followed by a reduction in functional efficiency which might neutralise the increase in cyclic efficiency. The use of recouperation by feed-water heating is always desirable, if not indispensable, with increased pressure; it reduces the condenser heat losses, but increases the weight of steam to be evaporated, so that the apparent consumption of turbines at 500 lb. to 570 lb. with pass-out heating is practically the same as that of turbines at 360 lb. with normal condensation. Whatever may be the advantage of air heating, especially when burning poor coal, pulverised, one cannot be certain in all cases of utilising effectively the calories recouperated by the air heaters, or of realising the equivalent economies by the reduction in first cost or upkeep. The use of high pressures and temperatures involves a number of constructive problems, especially regarding boilers and superheaters, which seem to have been solved, although matters relating to upkeep of tubes has given rise to some difficulties.

The principal considerations are the load factor, apart from peaks, based on the normal sustained maximum, the size of units used, and the price of the fuel. We will consider three cases: (1) a 1920 type station with 20,000-kW units, 1,500 r.p.m., and boilers with 10,764 sq. ft. heating surface, 298-327 lb., 482 607 deg. F.; (2) a station (1927) with two 20,000-kW units, 3,000 r.p.m., 2 cylinders, and boilers of the same surface operating at 355 lb. and from 607 to 752 deg. F.; (3) a station (1927) with from 20,000 to 25,000-kW units, 3,000 r.p.m., 2 cylinders, and boilers of the same surface at from 568 to 640 lb. and from 797 to 842 deg. F. The units were chosen for a sustained output of from 60,000 to 65,000 kW, giving from 70,000 to 75,000 kW at peak load, a type of station most suitable for French conditions outside the Paris area. To study the question of cost, figures are taken based on current wages and an assumption of 13s. 4d. per metric ton for coal of 10,200 B.th.u. per lb. delivered at the station.

The fixed annual charges are as follows: Money at 10 per cent.; depreciation, 20 years for buildings and 10 years for plant, with current wages for operation and upkeep, and current costs of materials for upkeep.

Stations are compared with the supposition of three sets in operation and one in reserve, each 20,000 kW.

Table I shows the capital cost based on 150 fr. to the £ sterling, Table II the annual charges, and Table III the operating characteristics.

TABLE I.

	1920 type. 256 lb. sq. in. at turbine. Thousands.	1927 type. 327 lb. sq. in. at turbine. Thousands.	1927 type. 540 lb. sq. in. at turbine. Thousands.
Buildings and civil engineering works	£200	£200	£200
Switchboard and electrical apparatus	66	66	66
Boilers and accessories ...	233	233	280
Turbines and accessories ...	160	186	193
Auxiliaries	26	26	33
Piping water and steam ...	46	46	53
Control apparatus and miscellaneous	13	13	20
	£744	£770	£845

TABLE II.

	(Annual costs in shillings per kW of useful power in round figures.)		
Money loan charges	24/11	25/10	29/5
Sinking fund	16/6	17/4	19/11
Wages	5/4	5/4	5/4
Upkeep costs	1/7	1/7	1/7
	48/2	50/1	56/3

Table III.

	1920 type	1927 normal type	1927 special type
Steam conditions in boiler ...	298 lb. and 707 F.	327 lb. and 752 F.	498 lb. and 842 F.
Calories per kg. steam at boiler	760	774	796
Temperature of heated feed	26·5 C. (80 F.)	26·5 C. (80 F.)	130° C. (266 F.)
Calories to be furnished by the boiler per kg. steam	733·5	747·5	666
Kg. steam produced per kg. of coal (also lb. steam per lb. of coal)	6·543	6·421	7·207
Steam at turbine inlet	256 lb. 662 F.	284 lb. 767 F.	426 lb. 797 F.
Steam per kWh at alternator terminals. Full load ...	10·20 lb.	9·05 lb.	8·90 lb.
¾ load	10·62 lb.	9·41 lb.	9·28 lb.
½ load	11·48 lb.	10·24 lb.	10·02 lb.
Coal per kWh. Full load at terminals	1·54 lb.	1·41 lb.	1·23 lb.
¾ load	1·62 lb.	1·46 lb.	1·28 lb.
½ load	1·76 lb.	1·59 lb.	1·39 lb.

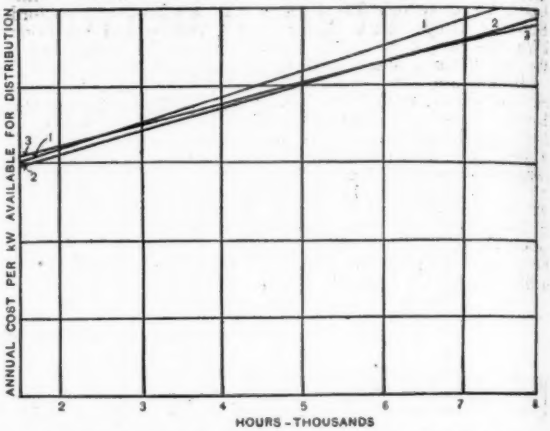
Of the capital charges, the cost of solid forged headers for the boilers working at the highest pressures is a material item.

Assuming an 80 per cent. boiler efficiency in each case, coal of 6,000 calories, and calories utilised per kg. of coal 4,800, we get the boiler house figures in Table III.

The figures in Table III have to be increased to cover the coal consumed by the auxiliaries and losses by radiation, &c., also the coal used during starting up, assuming the auxiliaries consume 7 per cent. and the losses are 3 per cent. The losses from starting up can be estimated as being equivalent to one hour's running on each occasion; with the lower annual utilisation this factor mounts up. Fig. 2 shows the relative annual costs per useful kW installed. The longer the period of operation the greater the economies of the 1927 high-speed type over the 1920 type, whereas the high-pressure machine has no advantage over the first until 2,500 hours have been run; it has no advantage over the second until after 5,700 hours, and at 8,000 hours the benefit is only 1 per cent.

The above figures are, of course, only applicable to the case considered, but it is in the elevation of pressures and temperatures that power station engineers are compelled to seek improvement in operating costs. The progress possible with regard to functional efficiency is limited, that already attained being remarkably high.

The figures given show that the interest in high pressures and temperatures of steam will be considerably increased if economic conditions improve or if the cost of high-pressure apparatus comes down to that of the plant at lower pressures,



Curve 1 (1920), 256 lb./sq. in., 662 deg. F.; Curve 2 (1927), 284 lb./sq. in., 767 deg. F.; Curve 3 (1927), 426 lb./sq. in., 797 deg. F.

Fig. 2.—Relative Annual Cost per Kilowatt.

and this cannot be done without materially modifying the principles of design and construction in vogue. The rapidity with which new apparatus can be perfected depends largely on the co-operation of workers and operators, and the French Society of Producers and Distributors of Energy can be a valuable factor in this direction.

[It may be noted that the higher cost of money in France, as compared with England, the result of the risks of losses through violent fluctuations in exchange and money values, operates more against high pressures and temperatures in France than in this country; hence the advantages would begin to be felt here at a lower annual plant load factor than is shown in the diagram. The stabilisation of the franc and the consequent lowering of interest rates are factors in the same direction. The comparatively low cost of the coal used tends to a certain extent to compensate for this.]

Electricity Supply in Great Britain.

Fuel Consumption Returns for 1927-28.

THE annual returns of the Electricity Commissioners entitled "Generation of Electricity in Great Britain," were issued last week (H.M. Stationery Office, price 1s. 6d. net). This year the summary tables showing the best results attained have been reinserted. Returns were received in respect of 570 generating stations, as in the previous year; the total output during 1927-28 was 9,927,850,630 kWh generated, an increase of 18.7 per cent. on the previous year's result; the total consumption of fuel, converted to terms of coal, was 9,224,151 tons, an increase of 4.1 per cent. (regard must be had to the effect of the coal dispute in 1926).

Turning first to the table of stations with lowest fuel consumptions per kWh generated, we find the Parton station of the Manchester Corporation again at the head of the list for Group A, with 1.39 lb.—not so low as in 1926-27, 1.33 lb.—but bracketed equal with the North Tees station of the Newcastle-upon-Tyne Electric Supply Co., Ltd. In Group B (100-200 million kWh generated) Grove Road station of the London Power Co., Ltd., stands first with 1.64 lb.; in Group C (50-100 million kWh) Agecroft station of the Salford Corporation records 1.60 lb., and in Group D (25-50 millions) Padiham station of the Lancashire Electric Power Co. not only is first, but beats all other steam stations with 1.37 lb. The only other station in this list showing less than 2 lb. per kWh is Prince Rock station of the Plymouth Corporation, 1.64 lb. (Group E, 10-25 million kWh).

Amongst the oil-engine stations Worthing Corporation heads Group F (5-10 million kWh) with 0.72 lb., but better results are shown by Macclesfield (0.67 lb.), Buxton (0.63 lb.), Bognor (0.62 lb.), and Cromer (0.63 lb.), in their respective groups. Under "gas-producer stations" Guernsey, Group G, records 1.50 lb.; Leek, Group H, 2.02 lb.; Stratford-on-Avon, Group I, 1.64 lb., and Thirsk, Group J, 1.45 lb.

The foregoing figures relate to weight of coal consumed, but a more just comparison is based on thermal efficiency, for which a separate table is provided. In this case Barton is first in Group A with 21.07 per cent.; Grove Road in Group B, 19.18 per cent.; Agecroft in Group C, 18.71 per cent.; Padiham in Group D, 21.03 per cent.; and Atherton (S. Lancashire Tramways Co.) in Group E, 17.76 per cent. The excellent performance of Padiham in both categories—1.37 lb. of coal, and 21.03 per cent. thermal efficiency—although its output was 45.2 million kWh, its maximum load was only 14,200 kW, and its annual station load factor only 36.2 per cent., calls for special notice. Barton, which showed a consumption of 1.39 lb. and a thermal efficiency of 21.07 per cent., had a maximum load of 72,360 kW and a load factor of 51.2 per cent., turning out 325.4 million kWh.

The thermal efficiencies in oil-engine stations were as follows: Worthing, Group F, 24.75 per cent.; Macclesfield (G), 27.40; Buxton (H), 28.59; Farnham (I), 28.55; and Cromer (J), 28.06. Amongst the gas-producer stations Guernsey (G), 18.55 per cent., alone calls for mention.

Much interest attaches to the Group Summary table of all stations; the most significant portion is found in the first five lines, which may be further summarised as follows:—

Group A, 9 stations: 2,464.7 million kWh; average 1.81 lb./kWh.
Group B, 11 stations: 1,557.3 million kWh, 1.91 lb.
Group C, 32 stations: 2,280.3 million kWh, 2.10 lb.
Group D, 46 stations: 1,679.7 million kWh, 2.23 lb.
Group E, 62 stations: 1,023.0 million kWh, 2.61 lb.

The total number of steam stations, 344, generated 9,500.6 million kWh at an average consumption of 2.16 lb./kWh. The 160 stations in Groups A to E generated 9,005 million kWh, and the remaining 184 stations generated only 496 millions. Incidentally, the average coal consumption of all steam stations in 1926-27 was 2.43 lb., a figure inflated by the use of inferior coal during the coal strike, for in 1925-26 the average was 2.40 lb. The reduction to 2.16 lb. must be regarded as highly satisfactory.

The oil-engine stations, numbering 128, generated 62.6 million kWh with an average consumption of 0.91 lb. of oil per kWh; and the 51 gas-producer stations generated 18.9 million kWh, with an average consumption of 2.24 lb. of coal per kWh.

The total output of the waste-heat, refuse-destructor, town's gas, and water-power stations, numbering 103 (of which number 56 "composite" stations have been included above), was 345.7 million kWh.

Finally summarising the figures, the total output of all stations was 9,927.9 million kWh, of which the steam stations produced 95.70 per cent., oil-engine stations 0.63 per cent.,

gas-producer stations 0.19 per cent., waste heat 2.19 per cent., refuse destructor 0.21 per cent., town's gas 0.03 per cent., and water power 1.05 per cent.

The greatest output of any undertaking was that of the Newcastle-upon-Tyne Electric Supply Co., Ltd., and Associated Companies—913 million kWh—of which 648 millions was produced by the three big stations, Carville, Dunston, and North Tees. Next came the London Power Co., Ltd., with 560 million kWh, of which 370 millions was produced at Deptford East and Grove Road. Manchester's total was 450 million kWh, the output of Barton station, 325 million kWh, being the largest for a single station.

Birmingham Corporation generated 336 million kWh, 262 millions coming from Prince's station. The County of London Electric Supply Co. generated 335 million kWh, mainly at Barking—313 millions. Glasgow Corporation generated 335 million kWh, Dalmarnock producing 266 millions. Liverpool Corporation generated 268 million kWh, Lister Drive producing 264 millions. The London Electric Railway Co. generated 307 million kWh at Lots Road, and the London County Council 214 million kWh at Greenwich. Sheffield Corporation generated 235 million kWh, of which 190 millions came from Neepsend. Clyde Valley Electrical Power Co. generated 219 million kWh, mainly at Clyde's Mill.

Load factors above 40 per cent. occur fairly frequently in the alphabetical table of stations, but in many cases this results merely from the transfer of load to the most efficient of a group of stations, which is used as a base-load station. In the case of independent stations, whilst high load factors mean low capital charges per kWh, they do not necessarily mean high thermal efficiency. Thus, for example, the L.C.C. tramway power station has a load factor of 44.6 per cent., but the thermal efficiency is 15.48 per cent.; and Lots Road with a load factor of 46.7 per cent. has an efficiency of 13.54 per cent. (though each station has an enormous output)—the plant in both cases being more or less out of date. Similarly the Metropolitan Railway (Neasden) station, with a load factor of 44.3 per cent., has an efficiency of 14.16 per cent., though the year's output is 120 million kWh. St. Helens Corporation, however, with a load factor of 48.1 per cent., has an efficiency of 16.82 per cent., though the maximum load was only 8,100 kW. Radcliffe station of the Lancashire Electric Power Co., with an output of 119 million kWh and the poor load factor of 25.7 per cent., had an efficiency of 17.11 per cent. and a coal consumption of 1.67 lb./kWh; and Bradford Corporation (Valley Road) with an output of 107.5 million kWh and a load factor of 29.3 per cent., recorded 17.17 per cent. and 1.74 lb./kWh.

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus for publication in this Section.

A Barber's Electric Water Heater.

One of the barber's most essential requirements, an adequate supply of hot water, is provided in a very convenient manner by the special form of automatic electric cistern supplied by Mr. Alan Wright, 124, Chancery Lane, W.C.2. The central feature of this "Inventum" barber's outfit, fig. 1, is a small storage tank in which a quantity of hot water is maintained always ready for use. Whenever the water is run off, the supply is immediately replenished and heated up to nearly boiling point by elements that are automatically controlled by a thermostat device. The cistern, complete with regulating tap, closing tap and non-return valve in the cold-water inlet pipe, mixing tap (connecting both hot and cold water supplies) to give any desired water temperature, shaving-water and test cock, piping and shampoo spray, is mounted on a polished back board ready for fixing on the wall, or in any other position adjacent to the wash basin. The container is thoroughly heat insulated, and the automatic control of the electric elements ensures that current consumption is proportional to the amount of hot water used.

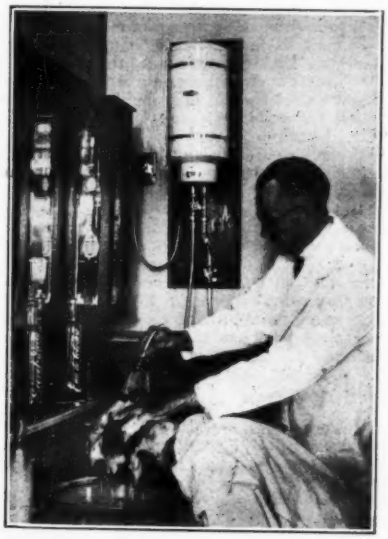


Fig. 1.—"Inventum" Barber's Outfit.

A Hole-digging and Pole-setting Machine.

A public utility company in America claims to be getting excellent results on pole-line construction with a special machine which incorporates a Buda-Hubron earth drill, made by the Buda Company, mounted on a Fordson tractor. This machine, which is supplied in this country by The Buda Company England, Cecil Chambers, Strand, W.C.2, is built around the tractor with the frame extended to give a longer wheel-base, thereby providing room for mounting the drill, a pole-hoisting boom, boom winch, hoisting winch, and the necessary operating mechanism. The drill is mounted above and in front of the front axle of the tractor, thus making it convenient for practically any hole location; it is driven by the tractor motor through pulleys and a belt, thus giving a flexible drive which is of advantage in absorbing the shock when the drill hits rocks, &c. The pole-hoisting boom is made in three telescoping sections, permitting length adjustments from 14 to 38 ft. The lower extremity of the two legs of the boom are formed into yokes which are attached to the tractor rear axle housing, one near each wheel. The pole-hoisting winch is set on the tractor frame directly in front of the radiator with its cable passing over pulleys located in the framework above the tractor motor and at the end of the boom. The winch is driven through a low-pitch screw gear and a transmission gear train for reversing. When using the hoisting equipment the transmission is connected to the tractor motor through pulleys and a belt. Pulleys for both the hoisting winch and drill are located so that one drive belt serves for connecting either with the motor pulley.

The American public company subjected its apparatus to various tests, and the following are some of the results:—7-ft. by 22-in. holes were dug in gravel and clay soils in an average of 3 min. per hole, including time for moving from one hole to the next and spotting; seven similar holes were dug in the time that two men sunk a 22-in. hole in the same kind of soil; a 2-ton transformer was lifted with the boom extended to its full 38-ft. length; the machine dragged a 55-ft. pole about 50 ft., put it in position for raising, dug a 7-ft. by 22-in. hole, raised the pole and moved up to the next hole in 15 min.

Tubular Lighting Reflectors.

The accompanying illustration, fig. 2, shows a selection from the range of "Straight-Lite" reflectors which is being manufactured by Messrs. Straight-Lite Reflectors, 65, Camden Road, N.W.1, and sold by Mr. H. S. Riant, 9-15, Oxford Street, W.1. The special feature of these reflectors is the exclusive design of the lampholder (Registered No. 7310181), which affords, it is claimed, perfect fitment and absolute freedom from bad contact. The holders consist of brass plunger contacts of generous dimensions completely embedded in solid porcelain blocks. The reflectors are generally made of drawn aluminium, highly polished, and have their edges neatly rolled. All the wiring is concealed, and the internal connections are made ready for installing. Type R reflector is designed particularly for shop windows and large display cases, and is constructed of mirrored fluted glass. There are various other designs suitable for showcase and picture lighting.

Fig. 2.—"Straight-Lite" Reflector.

An Electric Burner.

A recent production of the British Resistor Co., Ltd., Clare Road, Halifax, is the "Utility" electric burner, fig. 3, which has been specially designed for burning paint off doors, steel-work, and so on. The burner is fitted with 2¾-in. "Globar" elements which operate at about 1,075 deg. C. Special alloy-type terminals are employed which will withstand

Fig. 3.—The "Utility" Electric Burner.

the high-temperature conditions. The overall dimensions of the apparatus are 12 in. by 4 in. The approximate weight is 2.5 lb. It is supplied for use on all standard voltages from 100 to 250. The maximum loading is about 1,200 W, and the apparatus may be used on either a.c. or d.c. circuits.

Legal.

Compensation Claim Dismissed.

At Pontefract County Court, on September 24th, Judge McCarthy dismissed an application for £355 against the Stirling Boiler Company, Ltd., London, by the widow of David McCallum, a supervisor employed by the boiler company in work at the Yorkshire Electric Power Co.'s new station at Ferrybridge, who was fatally injured in a motor-cycle accident. For Mrs. McCallum, Mr. W. Stewart said the accident happened on August 22nd, 1926, when McCallum was motor-cycling either to or from the Pontefract Employment Exchange in response to a call by his firm, from London, for the insurance card of one of the workmen. Mr. John Neal, for the company, contended that there was no evidence whatever to show that on the occasion of the accident McCallum was going for, or had been for, the card; indeed, it was submitted that had that been so, he would have been on a different road. The Judge agreed with this contention and dismissed the claim.

Showroom Cashier Fined.

Johanna Thorpe (18) was charged at Accrington, on September 27th, with stealing £42 from the Accrington Corporation electricity showrooms on various dates. She was engaged at the showrooms as cashier and assistant, and money was taken by her to the Borough Treasurer's office. She was detected making a fraudulent payment, the sums she paid in not being equal to the sums she took from the showrooms. She left the showrooms and was not seen again until apprehended. Mr. A. Barlow, showroom manager, gave evidence of the deficiency. The Clerk said that the total deficiency was £145. The irregularities began about May, and the money had gone in clothes, &c. To account for her show of fashion she told people at the showrooms she had a private income. A fine of £10 or two months' imprisonment in default was imposed.

Electricity Summons Withdrawn.

When a case was called on at the Spalding Petty Sessions in which Messrs. Farrow & Sons, Ltd., engineers, Spalding, were summoned for unlawfully taking electricity from the Spalding U.D.C. supply, Mr. R. W. Hastings, clerk to the Council, applied for leave to withdraw the summons.

Mr. M. Merry, who appeared for the defence, said that his clients had a complete answer to the charge. There was no concealment and the prosecution had had every opportunity of ascertaining the amount of electricity used. The value involved was trifling.

Mr. Hastings said there were technical difficulties in the way of securing a conviction.

The Chairman of the Spalding Urban Council, Mr. E. I. R. Stapleton, said it was not a matter of value, but of principle. The bench allowed the summons to be withdrawn.

Correspondence.

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession.

Earth or Insulate?

We have read Mr. Stuart F. Philpott's letter in your current issue, and we beg to endorse his remarks regarding the insulation of fans and small motors.

We are the British agents of Messrs. E.M.I., of Utrecht, Holland, who specialise in these products. It is their practice to apply more stringent tests, including the pressure test, to the insulation than those specified by B.E.S.A., as can be testified by those of the Student Members of the I.E.E. who visited this works during their summer meeting concluded last month.

We might add that neither does our experience suggest that the insulation of a small motor is its most vulnerable part, but in any case the proportion of breakdowns is quite small, especially when one remembers the way motors are often misused.

Hogan & Wardrop.

London, *September 24th*, 1928.

Electrical Slogans.

I am intrigued, to say the least, by the recent contributions to this column under the above heading. Obviously, we must name the product, how, otherwise, can we be reasonably sure that the inference is perfectly understood? It is seldom wise to take anything for granted; and to reconcile the statement that such and such a thing goes without saying requires a great deal of faith in circumstances, particularly so when the experiment is likely to entail significant expenditure. In support of the contention that the product should be named and appear in the slogan, I may refer with advantage to a contemporary slogan familiar to most minds, reminding all and sundry to "Eat more fruit." Very probably this slogan achieves a greater measure of success than any similar effort we have yet seen in other directions; certainly, it has come to be regarded as the vindication of righteous publicity. What is the secret? A little reflection is sufficient to reveal the interesting fact that it could not, very well, be otherwise. The seed of advice, constituting the slogan, falls on especially prepared and cultivated ground; there are few hazards and many fortunate circumstances. In our present state of enlightenment, consider the mental agitation the slogan is able to inspire.

Instinctively, the mind responds to the message of the slogan, conscious of the advice and warnings it has received from time to time, emphasising the value of eating fruit for its medicinal qualities; its influence for good on the human system. The sequel of neglect is a common experience, and good health and bodily well-being are such vital qualities of existence that the slogan assumes the form of an apt reminder. We remember warnings in the past by distinguished physicians; we remember the advice and instructions received from recent public health campaigns; recent articles in the Press dealing with the broad question of national health; all of them emphasising the importance of eating fruit regularly, to maintain health and bodily perfection. Conscious of personal defects of system, and, perhaps, our past indifference on this point, we cannot afford to ignore the message of the slogan and at the same time we can appreciate the palatable form the necessary physic may take. Acting accordingly, we also secure mental contentment, true peace of mind. So we see, there is no magic in the words of even a phenomenally successful slogan. The achievement of success fundamentally pivots on impressions retained in the public mind, a condition inspired by constant education; mass suggestion and propaganda directed to especial ends. When the enlightenment of the public has so far advanced that the mention of the word electricity moves the public mind from the present apathy to a true apprisement of its value and significance, then we may expect a suitable slogan to achieve a parallel success; then, also, we may forget many simple things we find it necessary and important to repeat *ad nauseam* at the present juncture. Success may be accelerated by increasing the extent of our support of the activities of E.D.A. and E.L.M.A., conscious that this is the only way to ultimate success. We need more and more minds of the type of Col. Vignoles and Mr. Cramb, to mention only two by way of example, to off-set the bias of sectional interests. The letter of Mr. Scott damps my enthusiasm, because I am sensitive to the difference between trumpets and cornets; "sloganise electrical advertising" are words that seem sadly out of tune; it is a difficult matter to command interest and attention when there is recourse to unattractive language. This is partly true, also, of the contribution by (Mrs.) M. L. Matthews, but the imagination in her case is wonderful. She advocates that we entirely divorce the word "electricity" from our minds, and requests that we think electrically. The problem is to know how to begin; the query, does it mean a mental change? If we accept the advice and omit the word "electricity," what have we left? Nothing, beyond an imperfect expression, a grammatic confusion, vague, and indefinite, *viz.*, electric, electrical, electrically, scanty material with which to dress a national appeal. She says! SEW—BUT SEW ELECTRICALLY. I confess that I am not able to sense the appeal. I could understand

IF YOU DO SEW—Do So By ELECTRICITY.

Likewise, I could better understand the other slogans, in correct form.

If you must WASH—ELECTRICITY is clean and tidy.
If you must COOK—Heat by ELECTRICITY.
If you must SWEEP—ELECTRICITY will suit.

With regard to the chicks and the poultry spice, perhaps I may attempt the reconstruction of this one, also :—

If you must INCUBATE—Lay ELECTRICITY.

I can see Mr. Budd smiling at the thought of sharing the E.D.A. cheque, in respect of the following (with apologies) :—

ELECTRICITY—Made for a Maid.
A Tale of Two Cities—ELECTRICITY and Gas.
ELECTRICITY—For the Ways and Means.
Let ELECTRICITY provide the Energy.
Cable your Requirements to ELECTRICITY.
The Better Way—USE ELECTRICITY.
ELECTRICITY—The Urge of to-day.
For The Happy Day—ELECTRICITY.

I hope that, in due course, I shall be forgiven for any disinclination on my part to incubate electrically and so effectually; even though it should be for the good of the cause. There are, obviously, obligations in other directions.

James J. Ratcliffe.

Southport, *September 27th*, 1928.

The article "Electrical Slogans" appears in your paper at a time of special interest to me, as I have just passed through for publication several series of slogans—couplet slogans—covering the industrial, domestic, automobile, and general fields of electrical applications.

The first series appertaining to domestic utility articles is now in print, a proof copy of which is attached. These couplets form the subject matter of an instruction card, as the specimen herewith. All couplets precede the master slogan: "Do it Electrically," which was used by the American E.D.A. during the peak of its development campaign. I am also sending a few general slogans taken at random from the list :—

"Electricity—The matchless power."
"Electricity—The power for all—things great and small."
"Electricity—Preserves the paint. Has no smell of fumes that taint."

With the suggestion of the author that the slogan of B.E.D.A. is not quite up to the standard, as slogans go, I must entirely disagree. Its composition is a nature appeal: "For Health's Sake Use Electricity," not to the inner composition of the electrical industry, but to the prospective customers, who fundamentally go to make up that industry. To suggest a synthetic, unnatural, meaningless slogan supported by an artificial robot, which the average public mind would not, or could not, appreciate, would set back the clock of general electrical development for a very long period indeed.

I give a slogan to the writer of the article, as follows :—

"Help with your ability
To increase 'availability.'"

George Humphrey.

London, *September 28th*, 1928.

Like the debatable electrical slogan, I keep this short :—

Electrify—Everything.
(Elec-tricity Assists Everybody.)

Electrified.

September 28th.

[This correspondence is now closed.—Eds. Elec. Rev.]

Published Specifications.

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specification will be printed and abridged and all subsequent proceedings will be taken.

1927.

5,733. "Tapping switches or ratio-adjusting devices for electrical transformers." E. Fries and Hackbridge Electric Construction Co., Ltd. March 1st, 1927. (296,681.)

6,054. "Method of manufacture of insulated electric cables." J. E. Allan and S. B. Freeman. March 4th, 1927. (296,684.)

6,135. "Apparatus for the exploration of the ground by alternating currents." Dr. R. Ambronn. March 11th, 1926. (267,501.)

6,256. "Automatic telephone systems operating with high- and low-frequency electrical currents. Telefunken Ges für Drahtlose Telegraphie. March 5th 1926. (267,151.)

8,699. "Means or apparatus for automatically actuating control levers or arms of electric switches on the opening and closing of doors or the like." W. H. Browning March 30th, 1927. (296,688.)

12,464. "Party-line arrangements for telephone systems." E. Wehren. May 9th, 1927. (296,699.)

12,942. "Miners' and other electric safety lamps." W. Maurice and A. G. Guilliford. May 13th, 1927. (296,820.)

15,007. "Electromagnetic means for vibrating or reciprocating the spring-balanced or supported tables, screens, trays, or the like of concentrating, sifting, conveying moulding, and similar apparatus." J. W. Sherwen. June 7th, 1927. (296,742.)

15,161. "Electric time-switch mechanism." C. M. Williamson and S. Williamson. June 7th, 1927. (296,745.)

15,212. "Electrical measuring instruments." J. W. Record. June 7th, 1927. (296,749.)

15,269. "Thermionic amplifiers." E. W. B. Gill and R. H. Donaldson. June 8th, 1927. (296,806.)

15,351. "Telegraph systems." W. E. Beatty (Bell Telephone Laboratories, Inc.). June 9th, 1927. (296,811.)

15,384. "Electric phase-difference indicating devices." British Thomson-Houston Co., Ltd., and H. S. Petch. June 9th, 1927. (296,812.)

15,482. "Electrical load-sharing apparatus." A. Reyrolle & Co., Ltd., W. A. A. Burgess, and N. Cooke. June 10th, 1927. (296,815.)

15,489. "Apparatus for printing sound and picture records upon a film." W. E. Beatty (Bell Telephone Laboratories Inc.). June 10th, 1927. (296,816.)

15,700. "Frequency divider for electric waves." Standard Telephones and Cables, Ltd., and A. H. Reeves. June 13th, 1927. (2.6,827.)

15,857. "Electric frequency-transforming devices." H. Wade (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). June 14th, 1927. (296,829.)

15,862. "Electric terminals and the like." F. Read. June 15th, 1927. (2.6,831.)

16,258. "Electric lighting systems for cycles and other vehicles." J. Lucas, Ltd., and E. O. Turner. June 18th, 1927. (296,836.)

16,643. "Alternating-current rectifying installations." S. G. S. Dicker (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). June 22nd, 1927. (2.6,838.)

16,827. "Electric transformers." English Electric Co., Ltd., and W. E. M. Ayres. June 24th 1927. (2.6,839.)

16,897. "Protective devices for electrical apparatus." M. Buchholz. July 1st, 1926. (273,701.)

17,738. "Electrical regulating apparatus." J. Etchells and Metropolitan-Vickers Electrical Co., Ltd. July 4th, 1927. (296,848.)

18,535. "High-frequency electrical apparatus." W. J. Brown and Metropolitan-Vickers Electrical Co., Ltd. July 11th, 1927. (296,853.)

18,676. "Electric switches." General Electric Co., Ltd., N. E. Barber, and C. Higgins. July 14th, 1927. (296,855.)

18,796. "Electric irons, household and otherwise." R. E. L. D. T. D'Eyncourt. July 15th, 1927. (2.6,858.)

18,915. "Electrical driving of spindles for spinning, twisting, doubling, winding, and analogous processes." British Celanese Ltd., and E. C. Cope. July 16th, 1927. (Addition to 285,927.) (296,859.)

19,372. "Electromagnetically-driven horological instruments." Soc. Anon. des Etablissements Tecalemit. February 21st, 1927. (285,800.)

19,779. "Manufacture of electric radiators." A. Bates (trading as Willis and Bates (firm of)). July 26th, 1927. (296,866.)

20,164. "Electric-hare apparatus." D. C. Armstrong. July 29th, 1927. (Cognate application No. 20,780/27.) (296,868.)

20,312. "Timing or retarding device for use in connection with relay starters or controllers for electric motors." W. H. Scott. August 2nd, 1927. (2.6,871.)

21,116. "Cooling systems for dynamo-electric machines." Akt.-Ges. Brown, Boveri et Cie. August 26th, 1926. (276,654.)

21,284. "Boosting transformers with parallel-connected windings." G. L. Porter and Ferranti, Ltd. August 12th, 1927. (296,878.)

21,594. "Electrical switchgear." A. E. L. Scanes and Metropolitan-Vickers Electrical Co., Ltd. August 16th, 1927. (296,879.)

21,815. "Electric lamps and their shades." A. Bates. August 18th, 1927. (2.6,882.)

21,895. "Illuminating appliances." Holophane, Ltd., and R. G. Williams. August 19th, 1927. (296,884.)

21,896. "Illuminating apparatus." Holophane, Ltd., and R. G. Williams. August 19th, 1927. (296,885.)

23,562. "Altering the magnitude of the capacity values of air space cables." Kabelfabrik und Drahtindustrie Akt.-Ges. May 27th, 1927. (291,068.)

24,445. "Electric resistance units." British Thomson-Houston Co., Ltd., and R. D. Given. September 16th, 1927. (296,896.)

25,009. "Interchangeable set of relays for telephone purposes." F. Merk. September 22nd, 1926. (277,979.)

26,784. "Electric furnaces." H. George. October 27th, 1926. (279,818.)

27,762. "Electric relay systems." Standard Telephones & Cables, Ltd. (Western Electric Co. Inc.). October 19th 1927. (296,915.)

28,866. "Thermally-insulated vessels." British Thomson-Houston Co., Ltd. October 30th, 1926. (279,697.)

29,021. "Wire terminal connectors for electrical purposes." A. F. Waltz. October 31st, 1927. (296,921.)

32,611. "Lead sheathings for single-core alternating-current cables." Felten & Guilleaume Carlswerk Akt.-Ges. December 3rd, 1926. (281,709.)

34,199. "Electric furnaces." Soc. Electro-Metallurgique de Montricher. December 28th, 1926. (282,747.)

1928.

589. "Separators for electric batteries." W. L. Kann. January 7th, 1927. (283,221.)

759. "Electric strain insulators." Aktiebolaget Hoverken. July 27th, 1927. (294,597.)

884. "Electric battery lamps." A. E. O'dell (Elektrotechnische Fabrik Schmidt & Co. Ges.). January 10th 1928. (296,938.)

1,089. "Speed-regulating systems." British Thomson Houston Co., Ltd. January 29th, 1927. (284,316.)

2,356. "Smoothing pulsating electric currents." Westinghouse Brake and Saxby Signal Co., Ltd. (Union Switch & Signal Co.). January 24th, 1928. (296,944.)

2,356. "Apparatus for reproducing recorded sounds." H. J. Kuchenmeister. January 27th, 1927. (284,287.)

3,047. "Fluid-pressure-actuated electric switches with distant control." K. Muller and Celsa Anlasserbau Ges. January 31st, 1928. (296,947.)

4,507. "Driving arrangements for electric motors." C. De Patoul. April 28th, 1927. (289,455.)

9,129. "Apparatus for the electrical precipitation of suspended particles from gases." Lodge-Cottrell Ltd. (Lurgi Apparatebau Ges.). March 26th, 1928. (296,956.)

12,540. "Radio direction-finding apparatus." Marconi's Wireless Telegraph Co., Ltd. April 29th, 1927. (289,490.)

13,045. "Means for stabilising the voltage applied to an electric device energised by direct currents of electricity." F. C. Di Montecchio. May 3rd 1928. (296,964.)

20,059. "Electric telegraphy." W. E. Beatty (Bell Telephone Laboratories, Inc.). June 9th, 1927. (Divided application on 296,811.) (296,818.)

21,710. "Supporting devices for electrical conductors." Metropolitan-Vickers Electrical Co., Ltd. July 30th, 1927. (294,881.)

23,315. "High-tension cables provided with layers of paper insulation." Felten & Guilleaume Carlswerk Akt-Ges. August 20th, 1927. (295,932.)

Trade Mark Applications.

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be lodged within one month from September 26th :—

S.H. (lettering and design). No. 461,895. Class 8. Electrical measuring instruments.—Siemens & Halske Gesellschaft, Berlin. (British representatives: Haseltine, Lake & Co., 28, Southampton Buildings, Chancery Lane, W.C.2).

Brokla. No. 472,444. Class 8. Instruments and apparatus for use in radio-telegraphy and telephony.—Benjamin Electric, Ltd., Tariff Road, Tottenham, N.17.

Insol. No. 473,534. Class 8. Electrical dry batteries (not for medical purposes). No. 493,935. Class 13. Electric torches and lamps for torches.—Louis Holzman, 34, Kingsway, W.C.2.

Tricity. No. 493,044. Class 11. Electrical appliances or lamps for surgical or curative purposes.—British Electric Transformer Co., Ltd., Hayes, Middlesex.

Mycrome. No. 491,819. Class 13. Springs for electric switches, lampholders, plug adaptors, and like electrical fittings.—Mycromet Manufacturing Co., Clydesdale Street, Oldham.

Walker's Standard Electric Equipment (lettering and design). No. 491,147. Class 18. Electric cooking and heating apparatus.—Walker, Hunter & Co., Ltd., Camelon, Falkirk.

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

AYLESHAM (Kent).—Departmental stores, &c., for a local combine; Archibald, Barker & Price, architects.

BARNSLEY.—Four-storey building with shops (£12,540), for the T.C.; borough engineer.

BEXHILL.—Senior school; joint managers of St. Peter's and St. Barnabas Schools. 50 houses, Sidley Estate; Norman Smith & Son, Maidstone. Estate development, Pages Estate; J. E. Maynard.

BILSTON (Wolverhampton).—Works extensions; J. A. Jordan & Sons, Beehive Works, and Thompson Bros., Ltd., Niagara Foundry.

BIRKENHEAD.—Pavilion, with café, dressing and bathrooms, &c., Arrowe Park Estate, Woodchurch, for the T.C.; R. W. Johnston, borough engineer (returnable deposit of £2 2s.).

BOLTON.—Branch library, Tonge Moor: R. J. Tyson, builder, Great Lever.

BRADFORD.—216 houses, city architect, Town Hall; tenders to N. L. Fleming, town clerk (October 9th).

BRIGHTON.—Church, Dome Mission (£14,000), for the Wesleyan trustees; secretary.

BRISTOL.—Housing scheme (56), Fishponds, for the T.C.; L. S. McKenzie, city engineer (returnable deposit of £1).

BROMLEY (Kent).—Nursing home, Cottage Hospital; M. Waterhouse, architect, Staple Inn Buildings, London, W.C.1.

CARLISLE.—Extensions to Infirmary; J. Burnet, Son & Dick, architects, 239, St. Vincent Street, Glasgow (returnable deposit of £2 2s.).

CARSHALTON.—Houses (55), Sussex Road and Warnham Court Road, for J. M. Chappel, Ltd. Houses (26), Denmark Road, for Bannister & Harris. Extensions, Queen Mary's Hospital for Children (£200,000), for the Metropolitan Asylums Board: Wilson, Lovatt & Sons, builders, Clarence Street, Wolverhampton.

CHORLEY.—Extensions, motor works; Leyland Motors, Ltd.

CROYDON.—Extensions, Education Committee offices; borough engineer. 64 houses, Hermitage Road Estate, and 90, Mitcham Road Estate; Blackwell & Meyer, Bexley Heath. 26 houses, Lonsdale Road; Steele & Howes. Shops and flats, South End (£11,790); E. H. Smith, for Corporation.

DERBY.—Extensions to Derby School (£25,000), for the governors; F. S. Antliff & Son, architects.

DOVER.—Engine sheds, &c., for the Southern Railway Co., Ltd.; G. E. Wallis & Sons, Ltd., builders, Maidstone. Cinema, R. J. Barwick, builder.

DUDLEY.—Dairy (£20,000). Priory Estate, for the Co-operative Society; secretary.

DURHAM.—Primitive Methodist church, Browney Colliery; trustees.

GRIMSBY.—Extensions, Bracebridge Mental Institution (£100,000); Corporation and Hospital Committee.

HEDNESFORD.—Roman Catholic church (£35,000 to £40,000); G. Bernard Cox, architect, Birmingham.

HERNE BAY.—Re-erection of Casino Picture Palace, electrically equipped; A. G. Iggulden, J.P., C.C. Telephone exchange, Victoria Parl; H.M. Office of Works.

HORNCHURCH (Essex).—Housing scheme (60), for the U.D.C.; surveyor.

HULL.—Cinema (£20 000), Lake Drive; Gelder & Kitchen, architects, 120, Alfred Gelder Street.

HUNGERFORD.—Housing scheme (26), for the R.D.C.; surveyor.

IRISH FREE STATE (Dublin).—Wiring of new wing of Jervis Street Hospital; A. E. Porte, consulting engineer, 27, Lower Leeson Street.

KIDDERMINSTER.—Bank, for the National Provincial Bank, Ltd., London. Showrooms, Comberton Hill, for Laughton, Goodwin & Co. Extensions, Park Wharf Works, for the Carpet Manufacturing Co., Ltd.

LEICESTER.—Town Hall extension (£22,000); city engineer. Laying out, pavilions, &c., Leicester Abbey (£50,000); city engineer. Branch library, Southfields Drive; city engineer. Museum extension (£6,267); J. Chapman and Sons, Ltd.

LANARKSHIRE.—Colliery (up-to-date plant to be installed); manager, Coltness Iron Co., Glasgow.

LONDON (Barking, E.).—Factory, Creeksmouth; National Titanium Pigments, Ltd.

(East Ham, E.).—Administration block and new wards, Isolation Hospital; borough engineer.

(Hackney, E.).—Additions, Weymouth Works, De Beauvoir Road; G. Keetch & Sons. Factory, off Belfast Road; Francis Dod & Co.

(Ilford, E.).—32 houses, Babbacombe Gardens; Brand and White, Ltd. 104 houses, Castle Drive, &c.; S. Robinson, Ltd. 41 houses, Otley Drive, &c.; J. Aldridge. Telephone exchange, Cranbrook Wash; H.M. Office of Works.

(Leyton, E.).—School extensions (£17,563), for the Borough E.C.; director of education.

(West Ham, E.).—Refuse disposal plant (£56,000), and flats and shops (£5,887), for the T.C.; borough engineer.

(Highgate, N.).—Douglas Haig Memorial Hall, Elder Avenue; A. G. Shearing, 8, View Road, Highgate.

(Lewisham, S.E.).—Elementary school for L.C.C., Pendragon Road; J. G. Stephenson.

(Battersea, S.W.).—Out patients' department, Maternity Hospital; borough engineer.

(Wimbledon, S.W.).—Billiard hall, Haydons Road; Jas. Burges & Sons, Ltd. Extensions, factory of Hugh Stevenson, Ltd., Riverside Road; Jas. Burges, Ltd.

(St. Pancras, W.C.).—Additions, Central London Throat, Ear and Nose Hospital, Gray's Inn Road and Wicklow Street; governors.

LOWESTOFT.—Extensions, boat building premises, Adrian Works; J. W. Brooke & Co., Ltd. Factory, School Road; Alliance Artificial Silk, Ltd.

NEWCASTLE-ON-TYNE.—Central police station and fire station; city engineer.

NORTHERN IRELAND (Ballycastle, Co. Antrim).—Technical school for the North Antrim Regional Committee; W. Currie, Coleraine.

OAKHAM.—Re-erection of portion of Cottesmore Hall for the Marchioness of Bute (electrically equipped) (£25,000).

OLD FLETTON (Peterborough).—Police court for Hunts. C.C.; county surveyor, Walden House, Huntingdon.

PATCHAM (Sussex).—Hotel and restaurant, Patcham Corner; H. A. Costerton.

ROTHERHAM.—Technical college and school of art; director of education.

SOUTHEND-ON-SEA.—Bandstand enclosure (£19,050), for the T.C.; borough surveyor.

STAMFORD.—New wing for Infirmary; Traylen & Lenton, architects, 16, Broad Street.

STOURPORT.—Maternity hospital; U.D.C. surveyor.

SWADLINCOTE.—Housing scheme (80), Midway, for the U.D.C.; surveyor.

THORNTON HEATH.—Extensions of baths (£24,000); Croydon borough engineer. 106 houses, Beckford Road and Bert Road; P. Richardson. 53 houses, Barnfield Road; Paish, Tyler & Crump.

TIPTON.—Works, Priory Estate, for Wright's Forge & Engineering Co.

UCKFIELD (Sussex).—Post office and telephone exchange for H.M. Office of Works, King Charles Street, London, S.W. (returnable deposit of £1 1s.).

WAKEFIELD.—24 houses at Middlestown and 20 at Sharlston; Massie & Holdsworth, architects and surveyors, Wood Street; tenders to W. Druce, clerk to the Council, 18, St. John's North (October 9th).

WELTON.—Houses (42) for the R.D.C.; F. L. Leach, Midland Bank Chambers, Lincoln.

WESTON-SUPER-MARE.—Church of Corpus Christi (£14,000); John Bevan, architect, Bristol; Hendy and Sons, builders.

WHITEHAVEN.—Re-erection of warehouse, Market Place, for Wilson & Kitchin, chemists (several thousand pounds). Central school for the Borough E.C.; borough engineer (returnable deposit of £2 2s.).

WHITLEY BAY.—Public shelter and café for U.D.C. (£7,000); surveyor to Council.